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ABSTRACT

Schools have come under sharp criticism for their apparent ineffectiveness in reading instruction, due to interpretations of recent functional literacy survey results. Several of the major surveys are examined in this document, and in some cases their data are reanalyzed to answer additional questions. The conclusion reached from this examination and reanalysis is that the surveys do not provide enough evidence to support a sweeping indictment of the schools. On the other hand, schools are not providing effective reading instruction to a small but clearly identifiable population-those students who have failed to be promoted along with their age group. The implications of this analysis for the formulation of educational policy are discussed. An appendix describes the methods and findings of several functional literacy studies and provides an assessment of each study's validity and usefulness. (RL)

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FUNCTIONAL LITERACY AND THE SCHOOLS

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Preface

The schools have come under sharp criticism for the apparent ineffectiveness of the reading instruction they provide. The findings of recent functional literary surveys suggest that the school are graduating large numbers of people whose reading ability does not meet everyday demands. Critics even suggest that the schools are becoming less effective over time.

In *Functional Literacy and the Schools,* Donald L. Fisher critically examines several major surveys, often re-analyzing the data to answer additional questions. He concludes that the surveys do not provide evidence to support a sweeping indictment of the schools.

Instead, he finds that the schools are not providing effective reading instruction to a small, but clearly identifiable population: those students who have failed to be promoted along with their age group.

It is a pleasure to bring this scholarly and provocative essay to your attention. Project Officers for this report were Monte Penney and Edward Chalker.

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Introduction

Several recent surveys of reading achievement have identified large numbers of adults who are functionally illiterate—unable to read materials considered basic to survival in this society. These illiterates have difficulty reading such materials as classified ads, street maps, product directions, poison labels, and so on. More alarmingly, functional illiterates are not found solely among the population with little or no education. The surveys have identified functional illiterates among those who received a high school education or more.

The survey results have precipitated a rash of concerns. The first sections of this paper analyze the legitimacy of these concerns and the accusations which have evolved out of them. Two accusations stand foremost. First, high schools have been accused of graduating thousands, even millions, of functional illiterates (section 1). This accusation is at first glance supported by numerous surveys and observations. For example, the surveys referred to in this paper report that anywhere between 2 and 13 percent of the population with a twelfth grade education are functionally illiterate. We will argue that the upper estimate is greatly inflated, and more often than not misinterpreted. In general, we see no solid basis for the first accusation in any of the surveys of functional illiteracy administered to date. In fact, the evidence from the surveys points in just the opposite direction.

The second accusation centers on the effectiveness of today's schools. The schools of today are accused of being less effective than the schools of yesterday (section 2). Individuals or groups who level this accusation believe that education in general has deteriorated. Some claim that the value of a secondary education has decreased. Others place the blame on primary education. An analysis of the survey data does not support these claims.

The next section of this paper identifies what the writers consider to be a legitimate area of concern (section 3). While the evidence that high school graduates are often functionally illiterate seems a bit thin, the evidence that students who fail to graduate from high school constitute the bulk of the illiterates is much stronger. This is as true today as it was fifty years ago. Today, however, we tend to forget that there are students who never do receive a high school diploma.

In the last section of this paper, we examine the implications of the analysis for the formulation of educational policy.

Some historical background might be useful, however, before we proceed. First, we will summarize the results of several surveys used in this paper. Second, we will give examples of the concerns which these surveys have generated. Finally, we will present the general design of the surveys and survey instruments.

Harman (1970) estimates that more than 50 million adults are functionally illiterate.[1] A 1970 survey by Louis Harris and Associates identified 18 million adults as having less than adequate reading skills (Rosenthal, 1970b). A later survey by Harris (1971) identifies an equally large number of illiterates: it was estimated that more

than 15 million adults would have serious problems responding correctly to the printed word in real-life situations. The Adult Performance Level (APL) Project (1975) reported that more than 35 million adults read with some difficulty and an additional 39 million read with considerable difficulty. The National Center for Health Statistics (Vogt, 1973) found that more than 1 million noninstitutionalized youths 12 to 17 years old in the United States cannot read at the beginning fourth-grade level. On the whole, a less than sanguine picture emerges. Three of the above studies estimate that more than 20 percent of the adult population are not sufficiently literate. And one study (APL, 1975) places this estimate at more than 50 percent of the adult population.

The character of the problem can be looked at on an item-by-item basis as well as overall. In 1975 the National Assessment of Educational Progress administered the Mini-Assessment of Functional Literacy to 17-year-olds still in school (Gadway and Wilson, 1975). They found that—

- When given an automobile insurance policy, 83 percent of the sample were unable to determine correctly the maximum amount that the policy would pay if the driver injured another person in an automobile accident.
- When given an application blank with instructions for enrolling in a book club, 56 percent of the sample were unable to determine correctly the amount of money the applicant should send with the order for the books.
- When given a replica of a traffic ticket, 54 percent of the sample could not determine correctly the last day on which the fine could be paid.

Similar results were reported in a study done by the Educational Testing Service (Murphy, 1973). Significant numbers of adults could not understand items like those encountered on a fairly regular basis by many adults in their work and daily living. Train and bus schedules and directions for using household products proved especially difficult.

Estimates such as these suggest a serious problem. An education should at least prepare one to deal successfully with printed materials considered basic to social and economic functioning. The estimates suggest that for large numbers of individuals this is not the case.

Attention to the problem has been widespread. U.S. News and World Report ("Why 1.4 Million...," 1974) states:

> *The inability of many Americans to read and write—essential skills in today's technological society—is surfacing as a major worry in a nation that spends unending billions of dollars on one of the world's finest systems of education. (p. 37)*

Functional illiteracy has been given front-page coverage in the New York Times (Rosenthal, 1970a). Recent articles have appeared in the Washington Post ("Student Must Read...," 1976), Newsweek ("Back to Basics...," 1974; "Survival Test," 1975), and Saturday Review (Tobin, 1970).

Attention to the problem is not limited to the press. Federal, State, and local officials have all responded to the problem. At least five programs within the Department of Health, Education, and Welfare have been involved with the assessment of functional literacy. These have included the Division of Adult Basic Education, the Right to Read Program, the National Institute of Education, the National Institutes of Health, and the National Center for Educational Statistics.[2] The Department of Defense has funded a number of studies of work-oriented literacy.[3] The National Institute of Education places special emphasis on basic research that offers some hope of eventually reducing the extent of the functional literacy problem.[4] The functional literacy problem has been mentioned in the *Congressional Record*.[5] As early as 1968, James E. Allen, then U.S. Commissioner of Education, announced a

major drive against illiteracy with the hope of eliminating it by 1980. Functional literacy has received attention at the State and local levels as well. At least eight States have under active consideration one of two general sorts of proposals.[6] One proposal would require students to pass a test of functional literacy before receiving a high school diploma. The second proposal would grant students a diploma before they reach the 12th grade if they pass the appropriate equivalency tests. Four States have already enacted such proposals.[7] Similar proposals are under consideration by the city of Los Angeles and the District of Columbia.

In short, functional literacy has received more than passing attention. We turn now to a brief discussion of the surveys referred to in the following sections. We consider the 1970 and 1971 Harris surveys, the Educational Testing Service survey, the Adult Performance Level survey, the Brief Test of Literacy, and The Mini-Assessment of Functional Literacy.

The 1970 Harris survey measured performance on five items. Each item was in the form of an application. Sample applications were included for social security benefits, personal bank loans, public assistance, Medicaid and a driver's license. The examiner filled out the forms for respondents who were not able to write. Each application could require upwards of 15 responses. The items were administered to a sample representative of the civilian noninstitutionalized population (excluding Alaska and Hawaii) 16 years old and older.

The 1971 Harris study, like the earlier study, used application forms as items. Excerpts were taken from real application forms commonly used by many Americans: the social security form, the application for public assistance, the application for Medicare, an application for a driver's license, the original claim for unemployment benefits, the Selective Service System current information questionnaire, the U.S. individual income tax return form, the U.S. passport application, a typical credit card application, and a U.S. census form. Other questions were based on samples of classified employment ads, classified housing ads, and telephone dialing instructions. The results were based on each individual's response to the same 57 items. The items in this survey were administered to a sample representative of the civilian noninstitutionalized population (excluding Alaska and Hawaii) 16 years old and older.

The study done by the Educational Testing Service recorded responses to 170 items thought to be representative of reading materials encountered by the adult. The study was somewhat unusual in that the answers were part of the passages being read. Respondents were asked to circle the information in the passage that best answered a question asked at the beginning of the passage. The items were administered to a sample representative of the civilian noninstitutionalized population 16 years old and older.

The items used in the Adult Performance Level Project were selected from five areas of knowledge: consumer economics, occupational knowledge, health, community resources, and government and law. Each item was also classified by its use of one of five skills: reading, writing, speaking/listening, computation, and problem solving. The items were administered to individuals 18 years old and older living in households. The sample of households was representative of the households within all States except Alaska and Hawaii.

The Brief Test of Literacy was administered as part of the Health Examination Survey between 1966 and 1970 (Vogt, 1973). The reading part of the test consists of seven short passages of 40 to 50 words. Each passage is followed by three separate multiple-choice questions, designed to tap an individual's comprehension of the passage. The test was administered to a representative sample of all noninstitutionalized American youths between the ages of 12 and 17.

The Mini-Assessment of Functional Literacy (MAFL) was administered by the National Assessment of Educational Progress (NAEP) to a nationwide sample of 17-year-olds in 1974. Many items in the MAFL were similar to or identical to items appearing in a 1970 assessment of reading ability administered by NAEP. Thus, it is possible to chart changes in the functional literacy scores of 17-year-olds between 1971 and 1974. This possibility is unique to the MAFL.

These surveys provide the best information currently available for assessing the notions, that the schools are graduating large numbers of functional illiterates and that they are becoming less effective vis a vis the teaching of literacy. It must be noted that the data most central to these two accusations are not presented in the published reports of the various surveys. We have performed a number of estimates and alternative analyses in order to develop our arguments; these procedures are explained in footnotes. We must also call attention to the fact that there are no commonly accepted criteria for literacy. Each study developed its own criteria and we have accepted these criteria in our reanalyses except where their inadequacies bear upon the questions we seek to answer. The Appendix provides more discussion of the various surveys and criteria.

1. The Functionally Illiterate High School Graduate

The high schools have been accused of graduating large numbers of functional illiterates. An article in the Washington Post ("Literacy and High School...," 1975) states: "Schools in Virginia, like those in most other states, have been struggling for years with the anomaly of the high school graduate who cannot read." A summary report from the National Assessment of Educational Progress on the Mini-Assessment of Functional Literacy begins its introduction with these words:

> *It is a well known fact that every year many young Americans graduate from high school unable to read well enough to function adequately in everyday life. It is not simply that these people cannot read a great novel in depth; they cannot cope adequately with reading materials frequently encountered in everyday life such as road signs, advertisements, forms and reference works.*

National attention was focused on the high school illiterate in the case of *Peter W. Doe* vs. *The San Francisco Unified School District*. Doe graduated from high school a marginal literate and consequently sued the school system for educational malfeasance.

At first glance the surveys seem to support the notion that the high schools are graduating an alarmingly large number of functional illiterates. Consider the information in table 1. (The reader is reminded that the estimates reported in table 1 are based on reanalyses of the data in the original reports.[8]) The 1970 Harris study identified as illiterate approximately 2 percent of the population that had completed only 12 years of schooling.[9] The 1971 Harris study identified 4 percent of this population as illiterate,[10] and the Adult Performance Level Project found 11 percent of this population to be illiterate.[11] Because the studies have no common criterion for literacy, one might find the general agreement of the estimates more surprising than the disagreement. At any rate, one can do more than quibble with the estimates provided by the three studies. In fact, it is possible to find good reasons to disagree with all of the estimates.

Two arguments can be made which, if correct, considerably weaken the force of the accusation set forth in this section. First, an argument is made to the effect that the functional literacy label is misapplied in more than a few isolated cases. The effect of misapplying the label is to swell the number of functional illiterates. Second, an argument is made to the effect that the high school illiteracy rates may

reflect little more than errors in the test, or fatigue on the part of the test taker. We turn now to these arguments.

TABLE 1.
Estimated Illiteracy Rates (%) by Years of School Completed[1, 2]

Years of school completed[3]	Harris (1970)	Harris (1971)	APL
5	11	52	75
6	8	30	53
7	6	18	39
8	4	13	30
9	3	9	23
10	3	7	19
11	2	5	16
12	2	4	13

[1]Estimated rates rounded to nearest percent.

[2]Years of school completed has the same meaning in this report as in Census reports (see text footnote 9).

[3]The two Harris surveys and the APL survey did not report illiteracy rates by individual years of school completed. For example, the 1970 Harris survey reported illiteracy rates for only three levels of education: 0-8; 9-12; and 16 + . In order to arrive at the point estimates, a line was fitted through the observed data (see text footnote 8).

1.1 "Illiterates" Among Professionals and Managers. Functional Illiterates are by definition without the necessary skills to participate fully in many of life's most basic opportunities. Surely individuals in professional and managerial occupations are functioning or surviving well enough to get along. A direct contradiction arises if individuals in the most sought-after occupations are considered functionally illiterate. This contradiction does in fact exist. That is, the surveys classify significant percentages of the professional-managerial population as functionally illiterate. Of the population at the professional-managerial level, 5 percent were classified as illiterate in the 1971 Harris study, 11 percent as illiterate in the APL study, and 14 percent as illiterate in the ETS Study[12] (table 2). Surely one would want to conclude that the functional literacy label had been applied inappropriately to individuals in the professional-managerial class. Even if a significant proportion of this class in fact have difficulty reading, this problem has not held them back as indicated by their occupations. Their illiteracy does not hinder their functioning. Hence the label is misapplied.

If one assumes that between 5 and 14 percent of the individuals in the professional-managerial class are mislabelled (the estimate depending on the survey), it is not a very great step to infer that a similar mislabelling takes place in all occupations. And, if anything, the mislabelling in other occupations will be greater than the 5 to 14 percent above. Occupations other than professional or managerial should on the whole demand less reading ability. Thus, a range between 5 and 14 percent should give a conservative estimate of the mislabelling or misclassification errors across all occupations.

TABLE 2.
Observed Illiteracy Rates Among Professional—Managerial Workers and High School Graduates[1]

Group	Study		
	Harris (1971)	APL	ETS
High school completed	4%	11%	19%
Professional-managerial	5%	11%	14%

[1]The 1970 Harris study was not included because the results were not broken out by occupation.

Now, we can adjust the illiteracy rates of high school graduates for mislabelling (see table 2). No formal adjustment procedures are needed to make the following point however. It is clear that the illiteracy rates for individuals in professional-managerial occupations are almost identical to illiteracy rates among high school graduates. Thus we might well conclude that the high school illiterates, almost to a person, are all mislabelled. In other words, we have no reason to believe that high school graduates who performed poorly on the measures of functional literacy are indeed held back in life. It need not be the case that printed materials are getting in the way of their everyday functioning.

1.2 Fatigue and Errors in Test Construction. The illiteracy rate for a given level of education may be inflated by at least two additional factors. First it seems more than likely that the sample contains its share of individuals who fail to perform at their best for reasons of fatigue, boredom, lack of interest, stubborness, or the like. An estimate of the fatigue factor that best approximates the real fatigue factor can be based on the illiteracy rate in the population that has graduated from college. We believe this is so for the following reason. We assume that the fatigue factor is distributed equally throughout the population. Given this assumption, the error rate in the college graduate population should be influenced most by the fatigue factor. That is, the percentage of errors caused by fatigue and similar problems should be largest in the most able group. Common sense suggests that the finding of only 1 or 2 less-than-enthusiastic individuals out of a group of 100 would not be unusual. If we find more than a 1 or 2 percent error rate that commonsense suggests would occur among the best educated, we should become suspicious of the test. In fact, both Harris surveys and the APL survey show an illiteracy rate of less than 3 percent for the best-educated population. Therefore it is reasonable to believe that a large proportion of these errors may be the product of the factors named above.

Second, it seems more than likely that certain test items are bad. An analysis of the ETS items turned up problem items (Murphy, 1975). The author's analyses of the other surveys have also turned up problem items. (Fisher, 1976). The population best suited to adjust for problem items is again the most educated population. Everything else being equal, the proportion of errors caused by problem items in the college graduate population should be larger than in any other population.

The illiteracy rate for high school graduates is easily adjusted to reflect the above considerations. The adjustment takes into account factors such as fatigue and poor item construction. Both the adjusted and unadjusted data are presented in table 3. Estimates are reported for individuals completing 12 or more years of school.[13] Before adjusting for the above factors, we find anywhere between 2 and 11 percent of the population completing only 12 years of schooling that are illiterate. After adjustments, this figure ranges from no more than 9 percent (APL) to as little as 1 percent (both Harris studies). If we look at individuals completing 12 or more years of schooling we find that no more than 7 percent and as few as 0.6 percent are functionally illiterate.

TABLE 3.
Adjusted and Unadjusted Illiteracy Rates of High-School-Educated Adults

Study	Education			
	Unadjusted rate		Adjusted rate	
	12 Yrs.	12+ Yrs.	12 Yrs.	12+ Yrs.
Harris[1] (1970)	2	1	1	0.7
Harris[2] (1971)	3	2	1	0.6
APL[2]	11	9	7	6.9

[1]Unadjusted rates determined from table 1 and note 3 of table 1.

[2]Unadjusted rates taken directly from report.

1.3 Summary. The illiteracy rate when looked at alone and without qualification is undeniably high for individuals completing 12 years of schooling. We have suggested ways in which the illiteracy rate might be reinterpreted, in a more sanguine manner. This can be done while still accepting the literacy criteria set forth in the studies. We have seen that the methods used to estimate the number of illiterates are biased in the direction of overestimation. We have seen that if such factors as fatigue and item inadequacies are taken into account, the illiteracy rates for high school graduates become negligible in at least two of the studies.[14] And, most important, we have seen that estimates of functional literacy that take into account the behavior or position of an individual conflict with estimates of literacy based only on test performance. Between 5 and 11 percent of the professional-managerial class had scores that identified them as functional illiterates. Therefore, it may well be the case that anywhere between 5 and 11 percent of any population or group are misclassified. Taking this into consideration, we found that it was possible to infer that few if any functional illiterates were actually awarded high school diplomas.

However, we would not want to argue that functional illiterates are solely the creation of inadequacies in the survey instruments and design. We would not be surprised to find that we can classify as functionally illiterate anywhere between 1 and 2 percent of the population which will be graduated from high school in the future, and which will not go on to further education. We will speak at some length of this in section 3.

2. The Effects of Education

Most of the literature that mentions the functional literacy problem also mentions the schools. Today's schools are compared with the schools of yesterday. The comparison is unfavorable more often than not. The criticisms are not only a reaction to the results of various measures of functional literacy. They are a reaction to the decline in the Scholastic Aptitude Test and the American College Test scores (Silver, 1976), to the decline on science tests reported by the National Assessment of Educational Progress, to reports of large numbers of ill-prepared college students, and to a reported deterioration in reading scores in cities across the nation.

The schools in general are seen as having become too open, too liberal, too experimental. The acting superintendant of schools in Washington, D.C., in December 1975 said that he plans to "concentrate the school's resources on teaching students basic skills rather than attempt to create new educational programs." He went on to say: "We're not trying to do anything fancy....We want to teach our youngsters the essential skills needed to make them productive citizens" (Jones, 1975). Innovation is associated with a failure to teach the most basic skills. To restore the value of education, a return to basics is prescribed ("Back to Basics", 1974). In 1973 the chairperson of the National Commission on the Reform of Secondary Education said of the decline in SAT scores:

> *Its one more indication that high schools are in a state of extreme intellectual disrepair.*
>
> *At least half of the teaching in secondary schools today is devoted in one way or another to social relationships, and this is watering down the curriculum. The farther we get from the more rigorous academic courses in English, math and science, the more these scores are going to decline. ("Are High Schoolers...", 1973, p. 39)*

Though these remarks are made in reference to SAT scores, they could just as well have been made about functional literacy scores.

In short, the schools of today are accused of being less effective than the schools of yesterday. Many conceptual and statistical difficulties confound thinking about changes in school effectiveness over time — in particular, that younger and older cohorts differ in almost every imaginable characteristic in addition to differing in their school experience. Nevertheless, we shall try to learn whatever suggestive evidence a careful analysis of literacy data can provide about historical change in school effectiveness.

To begin, we will look at the results of a recent survey of functional literacy among 17-year-olds (section 2.1). Second, we will turn to the ETS and Harris surveys of functional literacy. These two studies allow us to compare the average scores among younger and older cohorts (section 2.2). Finally, in section 2.3, we will present an analysis which controls for the different levels of educational attainment among the various cohorts. Such an analysis suggests that schools are more effective today than they have been over the last 30 to 40 years.

2.1 Short Term Improvements. In 1975 the National Assessment of Educational Progress completed the first longitudinal assessment of functional literacy reported in this Nation (Gadway and Wilson, 1975). Seventeen-year-olds currently enrolled in school were tested in 1971 and again in 1974. Nationally a gain of over 2 percentage points was measured. This gain is striking because it approaches one-fifth of the maximum possible gain. Such a gain hardly supports the claim that the schools are becoming less and less effective.

The improvement cannot be readily explained away. One might attempt to do so

by pointing to the increase in the number of dropouts. However, the increase in dropouts can be estimated to account for no more than seven-tenths of a percentage point gain in the national score. This estimate we believe, is a conservative one because it is based on the assumption that dropouts get absolutely none of the items on the literacy measure correct.[15] In short, the gain reported by the National Assessment of Educational Progress points to an increase in school effectiveness.

2.2 Average Performance. The average performance of younger and older cohorts can be compared in only two studies — The ETS and 1971 Harris studies. The other studies do not provide the reader with enough information to make this sort of analysis. Such a comparison is of interest if the youngest cohort performs as well as the older cohorts. For in both the Harris and ETS studies, the average educational attainment of the youngest cohorts is significantly less than the educational attainment of the two cohorts immediately above it.[16] The average educational attainment of the youngest Harris cohorts, the 16- and 16- to 24-year-olds, is less than the average educational attainment of the 25- to 29-year-old cohort and less than the average educational attainment of the 30- to 49-year-old cohort (see table 4). And the average educational attainment of the youngest ETS cohort, the 16- to 20-year-olds, is less than the average educational attainment of the 21- to 29-year-old cohort and less than the average educational attainment of the 30- to 59-year-old cohort. In short, knowing only the average educational attainment of a cohort, we might expect the youngest cohorts to perform most poorly on the measures of literacy in both the 1971 Harris and the ETS Study.

The comparisons of average educational attainment were undertaken using the summary results reported by the various surveys. We did not have or could not obtain access to the original data. Nor did the studies themselves undertake the analyses we are about to report. The fact that we did not have access to the original data limits the types of possible analyses and constrains the range of inferences. We shall point out the limits and constraints as they arise in the discussion.

TABLE 4.
Average Educational Attainment By Age

Harris — 1971		ETS	
Age	Average[1] Attainment	Age	Average Attainment
16	9.764		
16-24	11.595	16-20	11.280
25-29	12.503	21-29	12.592
30-49	11.613	30-59	11.413
50 +	9.899	60 +	9.391

[1]See text footnote 16.

The results for the ETS study are displayed in table 5, the results for the Harris study in table 6. First, we consider the ETS study. There were a total of 170 different items in the ETS study. The items were grouped into 10 books with 17 items per book. Each book was seen by a different sample. The proportion of a cohort answering each of the 170 items correctly is reported. We are interested in the average difference between the proportion of 16- to 20-year-olds and 21-year-olds answering an

item correctly, and in the average difference between the proportion of 16- to 20-year-olds and 30- to 59-year-olds answering an item correctly.[17] Overall, the youngest cohort performs more poorly than the 21- to 29-year-old cohort.[18] This is both expected and comforting. The 21- to 29-year-old cohort has on the average completed over one additional year of schooling. However, the youngest ETS cohort does not perform significantly worse than the 30- to 59-year-old cohort. Unfortunately, since we do not have access to all the data, this estimate is subject to bias which cannot be computed, and the bias may increase or decrease the sample variance.[18] However, a difference of one-half a percentage point, even were it statistically significant, is of no great practical significance. Furthermore, in 6 out of the 10 books the youngest cohort actually performed better than the 30- to 59-year-old cohort. This is especially surprising given the stated purpose and content of the functional literacy measures. The items on the test presumably measured areas of knowledge and skills which should have increased or improved with age. The items on these measures were from the world of work, not from the classroom.

TABLE 5.
Item Mean Score by Age and Book for ETS

Book	Age			Effect[2]	
	16-20	21-29	30-59	16-20/21-29	16-20/30-59
1	.780[1]	.841	.807	.000[3]	.014
2	.830	.865	.826	.003	.922
3	.668	.717	.686	.000	.072
4	.748	.799	.746	.000	.564
5	.709	.778	.744	.000	.004
6	.795	.819	.788	.049	.692
7	.835	.846	.812	.215	.974
8	.793	.809	.785	.145	.726
9	.767	.771	.750	.400	.912
10	.750	.794	.786	.001	.003
Mean[4]	.768	.804	.773	.000	.089

[1]Average proportion of 16- to 20-year-olds answering an item correctly in book 1.

[2]The hypothesis being tested under the column heading, '16-20/21-29', is that the average difference between the proportion answering an item correctly in the 16- to 20-year-old cohort and the proportion answering an item correctly in the 21- to 29-year-old cohort is greater than or equal to zero. Similar remarks apply to the column heading, '16-20/30-59'.

[3]This is the probability that the null hypothesis is true (see above footnote and text footnote 17 and 18).

[4]Average proportion over all books.

The results which emerge from the Harris study paint a similar picture. Overall, the 16- to 24-year-old cohort does worse than the 25- to 29-year-old cohort, though the difference is just barely significant. However, as with the ETS study, our estimate of the significance of the difference will probably be somewhat in error.[18] The practical significance of a difference between a mean of 5.77 and a mean of 5.78 is not immediately clear. At any rate, the 16- to 24-year-olds perform better than the 30- to 49-year-olds. Again, this is somewhat surprising since the older cohort is

better educated (though not by much) and already in the position of having encountered functional literacy-like items many times over. The 16-year-olds, who are on the average almost two years behind in school, perform as one might expect. They fare poorly, more poorly than the 25- to 29-year-olds and more poorly than the 30- to 49-year-olds.

TABLE 6.
Mean Score by Age and Book for Harris, 1971

Book	Age				Effect[2]			
	16	16-24	25-29	30-49	16/ 25-29	16/ 30-49	16-24/ 25-29	16-24/ 30-49
1	2.92	2.99	2.99	2.97	.010	.052	.286	.962
2	9.94	9.96	9.92	9.91	.782	.848	.981	.997
3	8.84	8.85	8.90	8.92	.134	.007	.228	.038
4	3.86	3.91	3.94	3.87	.006	.388	.100	.938
5	8.86	8.85	8.86	8.85	.504	.622	.367	.468
6	7.80	7.90	7.86	7.83	.124	.206	.939	.998
7	5.70	5.82	5.84	5.87	.019	.000	.328	.034
8	2.62	2.82	2.92	2.83	.000	.000	.007	.435
9	3.81	3.82	3.86	3.77	.222	.798	.222	.901
10	2.47	2.74	2.73	2.69	.000	.000	.520	.853
Mean	5.68	5.77	5.78	5.75	.000	.000	.089	.900

[1]Average number of questions answered correctly by the 16-year-old cohort in book 1. For books 1 through 10 there were, respectively, 3, 10, 9, 4, 9, 8, 6, 3, 4, 3 questions per book.

[2]'Effect' has the same meaning here as it does in table 5, table footnote 2.

2.3 The Efficiency of Education. In the last section we found that the youngest cohorts performed well overall when compared with the older, better educated cohorts. In this section we will change our focus from a measure of overall performance to a measure of illiteracy. We will concentrate on the comparison of illiterates across cohorts. Furthermore, we will try to 'remove' the effects of different levels of educational attainment across cohorts before making our comparison. The adjustment procedure is rather unorthodox, and will require an explanation. This procedure or analysis was undertaken originally to circumvent the need for data from individual subjects. As already mentioned, only certain summary results were reported in the published accounts of the surveys. However, as far as we can determine, the conclusions would change only slightly if at all, were we to have the complete set of data. Before looking at the results of the analysis, we turn to a discussion of the procedure used to determine the effectiveness of education.

In general terms, the procedure is simple enough. An example can best serve to introduce this procedure. Suppose we have two cohorts, both of the same size and both with the same illiteracy rate. The illiteracy rate, C1, of the first cohort is 50% and the illiteracy rate, C2, of the second cohort is 50%. Suppose we have two levels of educational attainment, E1 and E2, with illiteracy rates respectively of 90% and 10%. Finally, suppose that 40% of the first cohort is in E1 and 60% of the first cohort is in E2, while 60% of the second cohort is in E1 and 40% is in E2. Then the predicted illiteracy rates for the first and second cohorts, C'1 and C'2, are:

$$C'1: \quad ((.4 \times .9) + (.6 \times .1)) = .42$$
$$C'2: \quad ((.6 \times .9) + (.4 \times .1)) = .58$$

On the basis of education, C2 is greater than C2 and C1 is less than C1. Therefore one might conclude that the second cohort's education was actually better than average, while the first cohort's education was actually worse than average.

In other words, if the illiteracy rate for each given level of education has remained the same across the years, then the predicted rate for a cohort should be identical to its obtained rate (within the limits of sampling variation).[19] However, if we find that the predicted rate is greater than the obtained rate, we can infer that the educational effectiveness for a given cohort has increased. Or conversely, if we find that the predicted illiteracy rate is less than the obtained rate, we can infer that the educational effectiveness for a given cohort has decreased. In any case, the predicted and obtained rates are unbiased estimates of the population rates.[20] An estimate of the variance of each of these estimates can be obtained.[21] And once we know the variance of these estimates, we can test the significance of the difference between obtained and predicted rates.

We are now ready to discuss the application of the above method to the survey data. The discussion proceeds in two steps. First, we analyze the data from the two Harris surveys, the ETS survey and the APL survey. The conclusion we reach is straightforward: the schools are, or appear to be, more effective for younger cohorts than for older cohorts. Second, we examine the possible arguments and evidence one might marshal against this interpretation.

The results of the analyses are displayed in table 7. These results fail to support the claim that the value of an education has deteriorated greatly. In four out of four studies the predicted rate for the youngest cohort is greater than the obtained rate. The 1970 Harris study finds that 1% of the 16- to 24-year-old cohort is functionally illiterate while we predict that over 2% of this cohort should be illiterate. The 1971 Harris study finds that 2% of the 16- to 24-year-old cohort is illiterate while we predict that 4.9% of this cohort should be illiterate. The ETS and APL studies show similar discrepancies in predicted and obtained rates. In three out of four studies the difference is significant, although only marginally so in two of the studies. Furthermore, the ratio of obtained to predicted scores is as low as 0.4 in the 1971 Harris study. This ratio can be looked upon as an index of inefficiency: the higher the ratio, the more inefficient the schools. Turning to the oldest cohorts, it appears as if they had fared rather poorly. In three out of four studies the predicted rate is lower than the obtained rate. In two out of four studies the difference is significant. Finally, in both the 1970 Harris study and the APL study, the inefficiency index climbs as high as 1.3 for the oldest cohort.

Several agruments can be raised against the interpretation given to the above results. We will consider only three. First, it will be noticed that the method by which the predicted scores are derived is insensitive to differences in educational attainment within a given level of education. For example, the average educational attainment of individuals with less than an eighth-grade education in the 16- to 24-year-old cohort could be significantly greater than the same measure within older cohorts. Such a fact would tend to inflate the predicted illiteracy rate and therefore decrease the inefficiency index.[23] The data needed to investigate this claim are presented in table 8. In the 16- to 24-year-old group the average educational attainment of individuals with less than an eighth-grade education is 6.8 years, while in the cohort 50 years old and older the average educational attainment is 6.2 years. However, average educational attainment is almost equal in the two cohorts for individuals receiving between 9 and 12 years of schooling. And the results are just reversed for those reporting at least some college education.

TABLE 7.

Predicted and Obtained Illiteracy Rates and Index of Inefficiency by Age for 1970 Harris, 1971 Harris, APL and ETS Studies

Study	Age	Predicted illiteracy rate	Obtained illiteracy rate	Index of inefficiency	Significance
		%	%		
Harris 1970	16-24	2.1	1[1]	0.5	$p < .09$
	25-29	2.0	2	1.0	ns
	30-49	2.5	2	0.8	ns
	50+	3.8	5	1.32	ns
		%	%		
Harris 1971	16-24	4.9	2[2]	0.4	$p < .001$
	25-29[3]	4.3	6	1.4	ns
	30-49[3]	6.6	7	1.1	ns
	50+	12.2	10	0.8	ns
APL	18-19	0.184	0.180[4]	0.978	ns
	20-29	0.139	0.158	1.139	$p < .07$
	30-39	0.171	0.119	0.695	$p < .0001$
	40-49	0.199	0.186	0.937	ns
	50-59	0.235	0.280	1.194	$p < .002$
	60-64	0.262	0.345	1.317	$p < .001$
ETS	16-20	0.510	0.482[5]	0.945	$p < .09$
	21-29	0.439	0.382	0.870	$p < .00001$
	30-59	0.517	0.471	0.911	$p < .01$
	60+	0.640	0.800	1.250	$p < .000001$

[1]Individuals answering fewer than 70% of the items correctly.

[2]Individuals answering fewer than 90% of the items correctly.

[3]The illiteracy rates reported in the 1971 Harris survey were for 25- to 30-year-olds and for 31- to 49-year-olds. This is reported above as the obtained rate for 25- to 29-year-olds and 30- to 49-year-olds. The predicted rates were based respectively on the educational attainment of the 25- to 29-year-olds and the 30- to 49-year-olds.

[4]Individuals in APL level 1. The rates are based on data received from the APL project staff, and not on the summary statistics reported *Adult Functional Competency: A Summary* (1975a). The principal difference between the two sets of results lies with the illiteracy rate for the 8-11th graders. We have not yet been able to account for the source of the difference.

[5]See text footnote 22 for explanation of illiteracy levels.

It is possible to base the calculations of predicted values on equations which take into account the different levels of educational attainment within the broader categories of education.[24] The results of such an adjustment have been tabulated for the 1970 Harris study. In no case is the change introduced by the adjustment in the illiteracy rates more than a tenth of a percentage point. And the rates for the youngest cohort remain virtually the same after adjustment. This is what might be expected. Increases in average educational attainment in one level are attended by decreases in another level. Therefore, the adjustments make little difference in the overall expected number of illiterates for each of the cohorts.

TABLE 8.
Average Educational Attainment by Level of Education and by Age

Age	Educational level		
	0-8	9-12	13+
16-24	6.8[1]	11.1	14.3
25-29	6.5	11.5	15.2
30-49	6.4	11.4	15.2
50+	6.2	11.2	15.1

[1]Average educational attainment is reported as average number of years of school completed by population within a given level of education.

Having countered one objection, there remain two more arguments against the notion that schools are becoming more effective. First, the trend might be accounted for by a deterioration of performance with age. Second, the trend might be accounted for by an increase in the general intelligence of students within the schools. This second argument is not especially convincing. Commonsense suggests that as education has become more universal — less the property of the elite — over the past 50 years the average ability of students has decreased.

If performance deteriorates with age, then the factors that affect or constitute performance should show a similar deterioration. Performance depends in part on knowledge and in part on the abilities required to put the knowledge to use. If the above objection holds, then a decrease in performance with age should be observed with tests that tap either knowledge or reasoning abilities.

Hyman, Right, and Reed (1975) provide some of the data necessary to make a determination of the relation between knowledge and age. They identify a series of surveys between 1949 and 1971 that attempt to measure certain aspects of a respondent's knowledge. Several of the surveys administered 12 or more years apart contained the same or similar items, allowing an assessment of the performance of individuals across time. Summary data are presented in table 9. Except for one case, the percentage of individuals answering a given set of items correctly increases. There is no indication that knowledge decreases in any group under 60. And there is only a slight decrease in the knowledge of those over 64 when compared with those 10 years younger. The net gain of the oldest cohort over the youngest is still positive. Furthermore, this decrease is only evident for those with a high school education. No decrease is noted for those with either an elementary or a college education. In short, one cannot easily point to decreases in knowledge as a reason for decreases in performance on the basis of the evidence reported by Hyman, et al.

Perhaps a change in reasoning abilities can explain what knowledge could not. Cross-sectional studies of logical-problem-solving abilities like those devised by John (1957) have consistently shown age differences (Jerome, 1972; Young, 1966). However, when the data are looked at longitudinally, no marked deterioration over time occurs for those under 70 years old (Arenberg, 1974). Arenberg's results are not generalizable to the entire population. The majority of subjects had received some college education. However, the results do argue against a universal decline in reasoning ability. Furthermore, such results argue against an alternative interpreta-

tion of the Adult Performance Level Project results. The youngest cohorts received a better education than the 50- to 59-year-olds and the 60- to 64-year-olds in both level 1 and level 2. (Fisher, 1976).

TABLE 9.
Average Gain in Knowledge by Age and Educational Attainment[1]

Age at first measure	Age at second measure	Educational attainment 0-8	12	16
25-36	37-48	10.0[2]	4.5	3.7
37-48	52-63	8.5	0.7	5.2
49-60	64-75	0.0	−1.6	6.7

[1]Data from Hyman, Right, and Reed (1975).

[2]Gain is reported as difference between percentage of population answering question correctly on first measure and percentage of population answering question correctly on second measure.

2.4 Summary. A considerable amount of public attention has been paid to the notion that education is becoming less and less effective with each passing year. We find no basis for this claim if either average performance on literacy measures or functional illiteracy rate are used as yardsticks of school effectiveness. In fact, the evidence points to increases in the effectiveness of schools. We have presented three sorts of evidence. First, when we looked at the average performance of 17-year-olds in 1971 and 1974 we found a significant increase. Second, we compared the overall performance of younger and older cohorts. In the ETS study, we found the 16- to 20-year-olds failed to differ significantly from the 30- to 59-year-olds even though the older cohort was better educated and presumably better acquainted with the test materials. In the Harris study we found a similar phenomenon. Third and finally we compared the relative efficiency of younger and older adults' education. We tried to remove the effects of different levels of educational attainment across the various cohorts. Again, we found that the youngest cohorts are faring surprisingly well. This is true across each of the four studies examined. In short, the prevailing evidence is a harbinger of an increasingly literate society.

3. Focusing Upon the Real Illiteracy Problem

In section 1 we found reasons to doubt the claim that the functional illiteracy rate is especially high among the population of high school graduates. In this section we find additional reasons to doubt this claim. More importantly, we find evidence which points to a population which we think should be the proper focus of some concern.[25] The population is surprisingly easy to identify. It consists of individuals who have repeated one or more grades. Several preliminaries must be dealt with before reporting the results. First, we must say something about the survey we will use in this section. Second, we must describe the process by which we identify the illiteracy rate for repeaters.

The Brief Test of Literacy was described in the introduction. It will be remembered that the test was administered to a nationally representative sample of 12- to 17-year-olds. An individual was classified as illiterate if he or she scored below the average scores obtained by the bottom four-fifths of entering fourth

graders. Both the materials used on the Brief Test of Literacy and the method by which individuals are labelled illiterate are far from ideal. However, at least one factor recommends the study. It is to be expected that individuals classified as illiterate on this measure would be classified as illiterate on the measures of functional literacy considered in previous sections. The relative agreement between the estimates of illiteracy given by the Brief Test of Literacy and other measures is some sort of corroboration. If anything, we would expect the comparison of illiteracy rates among repeaters and non-repeaters to be more marked in other studies.

Now we must describe the process by which we determine the illiteracy rates for repeaters. While individuals who have repeated a grade are not specifically identified by the survey as such, we would argue that one can reasonably infer their identity from the data. The information needed to make the inference is reported in table 10. Since all states require students to attend first grade either before their seventh birthday or upon having reached their seventh birthday, the identification of the illiteracy rate for repeaters seems simple enough. We assume that 12-year-olds in the fifth grade are repeaters, that 13-year-olds in the sixth grade are repeaters, that 14-year-olds in the seventh grade are repeaters, and so on. It should be noted that such a procedure is conservative.[26] That is, we will tend to underestimate the illiteracy rate for repeaters.

We turn to the analysis of the information in table 10. The illiteracy rates of individuals behind only 1 year are often four times larger than the illiteracy rates of students within grade. For example, 3.2 percent of the 14-year-olds in the 8th grade are illiterate while 14.2 percent of the 14-year-olds in the 7th grade are illiterate. The illiteracy rates of individuals behind two years are upwards of seventy times greater than the illiteracy rates of students not held back. The APL data point to the same population. Eighteen and nineteen-year-olds having completed between 6 and 8 years of schooling are more likely to have been held back one or more years. And they are the population with a disproportionate number of illiterates.

One other observation is worth making. It will be noticed that the overall illiteracy rate for cohorts bounces around quite a bit. Though there does exist a significant linear trend across cohorts, no single age group shows a significantly higher rate than all others (Vogt, 1973). Two reasons for these results are suggested by the data. First, one notices the large reduction in the illiteracy rates of 16-year-olds repeating one or more years of school. One might well conclude that many of the illiterate students are dropping out of school as soon as possible. Second, one notices the extremely high illiteracy rate among students in special placement. Furthermore, one notices that the illiteracy rate does not decrease after a year in special placement. This suggests that the schools are simply unable to meet the needs of a certain small percentage of the students at present. These students may find themselves in special placement. Or they may find themselves in regular classrooms. In any case, they are unlikely to gain anything from school.

4. Conclusion

The results of several national surveys of functional literacy have been reported. Taken at face value these results reflect rather unfavorably on the quality and progress of education over the last fifty years. In section 1 we found that anywhere between 2 and 11 percent of the population with a twelfth grade education was identified as functionally illiterate. However, a reinterpretation of these findings is possible, and we believe legitimate. Specifically, we found that one might reasonably conclude that the high schools were graduating very, very few functional illiterates. It could well be the case that the functional illiteracy rate among high school graduates is significantly less than one percent. In section 2 we looked at the

TABLE 10.

Estimated Rates of Illiteracy and Associated Standard Errors for Youths by Age and Grade Placement in School: United States, 1966-70

Age	Total	Grade placement											
		None-4th	5th	6th	7th	8th	9th	10th	11th	12th	Beyond 12th	Drop-out	Special place-ment
		Rate per 100 youths											
Total	4.8	80.2	43.3	11.7	5.9	3.2	2.4	1.3	0.6	0.7	-	20.5	74.8
12 years	6.9	*	37.7	7.1	2.8	0.8	*	...	...	...	...	...	81.2
13 years	6.2	*	*	28.3	6.6	1.5	-	*	*	...	...	...	*
14 years	3.8	*	*	*	14.2	3.2	0.8	-	*	*	...	*	*
15 years	4.4	*	*	*	27.7	22.5	4.7	0.3	0.7	*	*	*	*
16 years	2.7	*	*	...	*	*	3.3	1.8	0.1	0.6	*	21.0	*
17 years	4.4	...	...	...	*		*	9.7	1.5	0.7	-	20.0	*
		Standard error											
Total	0.40	16.65	7.81	1.99	0.83	0.41	0.89	0.26	0.20	0.37	-	3.40	5.33
12 years	0.71	24.24	8.98	1.85	0.63	0.80	—	—	—	—	—	—	10.59
13 years	0.84	—	—	4.76	2.02	0.33	-	—	—	—	—	—	—
14 years	0.56	—	—	—	3.88	1.07	0.43	-	—	—	—	—	—
15 years	0.64	—	—	—	14.96	8.09	1.48	0.18	0.88	—	—	—	—
16 years	0.53	—	—	—	—	—	2.22	0.66	0.11	0.58	—	4.63	—
17 years	0.73	—	—	—	—	—	—	3.32	0.68	0.45	—	4.19	—

Source: Vogt (1973). Symbols: 1. Data not available —
2. Category not applicable ...
3. Quantity zero -
4. Figure does not meet standards of reliability or precision *

issue of school effectiveness. The evidence from three out of four surveys did not support the contention that education was becoming less effective. Finally, in section 3 we pointed to the population with conspicuously high illiteracy rates, the population of students held back in school one or more years. And, we noted that the illiteracy rates of 12- to 17-year-olds did not differ significantly.

In the remaining few paragraphs of this section we want to comment briefly on the implications of the analyses in the previous sections of this paper for selected policies within education. First, we discuss the implications of the decrease in the functional illiteracy rates in younger cohorts. Second, we discuss the implications of the rather high illiteracy rates of students who have repeated one or more grades.

First, then, we turn to the implications of the analyses undertaken in section two. Overall, the analyses would seem to support the recent educational reforms. On the whole, 17-year-olds were more functionally literate in 1974 than they were in 1971. Gains were measured in almost all sectors of the 17-year-old population (Gadway and Wilson, 1975). Since the educational attainment of the two groups of 17-year-olds is not significantly different, we would argue that these results point towards an increase in the quality of the education received by the lowest achievers. We also saw that an increase in the quality or efficiency of education was apparent when we compared the relevant indices of effectiveness of the younger and older cohorts. Such results certainly do not prove that educational reforms have on the balance been beneficial. But they make it unlikely that educational reform has had disastrously negative effects.

Second, we turn to the implications of the analyses in section 1 and 3. First, we noted that the illiteracy rate for 12- through 17-year-olds remained relatively constant at 5 percent. Second, we noted that the illiteracy rate for repeaters was much, much higher than the illiteracy rate for non-repeaters. And third we noted that the illiteracy rate for high school graduates was comparatively low (around 0.5 percent). These results imply the following. First, the schools are identifying the majority of functionally illiterate students. They are the students held back one or more years. Second, the schools are failing to provide the help necessary to decrease the number of functionally illiterate students between the ages of 12 and 17. The illiteracy rate remains much the same for these individuals. Third, the majority of functionally illiterate students are dropping out of high school before they graduate. In short, it appears that future programs within education which seriously concern themselves with the problem of functional literacy should direct their attention at the students held back one or more years. Some of these students show little if any improvement between the age of 12 and the time they drop out of school.

We believe that sufficient evidence exists to warrant a major shift of research and instructional efforts towards a clearly defined population — those who have repeated one or more grades.

Notes

1. In the 1960 census, 58.6 million individuals age 25 and over had less than 12 years of schooling.

2. The National Institute of Education funded an effort by the Educational Testing Service (Murphy, 1973). The Right to Read Program extended the work of the National Assessment of Educational Progress into the area of functional literacy (Gadway and Wilson, 1975). The Division of Adult Basic Education sponsored a large assessment of functional literacy referred to as the Adult Performance Level Project (1975). The National Center for Health Statistics developed and administered the *Brief Test of Literacy* (Vogt, 1973). The National Center for Educational Statistics has funded the National Assessment of Educational Progress.

3. Much of the literacy research done for the Department of Defense has been carried out by the Human Resources Research Organization (Caylor, et al., 1973; Sticht, et al., 1973; Sticht, Caylor, and Kern, 1971; Vineberg, et al., 1971). The research has centered on the assessment of functional or work-related literacy (Sticht and Beck, 1976) as well as remediation of military personnel with inadequate reading skills.

4. One of the major focuses of the Learning Division within the Basic Skills Program (1975) has been functional literacy. The division was involved in the ETS assessment of functional literacy. The Measurement and Methodology Division within the Basic Skills Program has outlined one of its major research areas in the 1976 Basic Skills Research Grants Announcement as "research aimed at providing a good foundation for the current movement toward criterion-referenced tests; that is, tests whose scores can be interpreted in terms of mastery of a skill or domain of knowledge without reference to the performance of other test-takers." A focus within the law and education section of the same grants announcement spells out a clear commitment to research directed toward the problems of the functional illiterate: "NIE wishes to support research that will contribute to the development of educationally valid and legally enforceable standards and criteria for a quality education in the basic cognitive skills, particularly reading and mathematics."

5. Functional literacy has been mentioned in connection with budget, authorization, and other hearings. The interested reader might turn to the hearings before the Subcommittee on Education of the Committee on Labor and Public Welfare (U.S. Senate, 1973a).

6. Legislation is pending in Arizona (SB 1138), California (AB 1731, AB 3408, AB 2559), Florida (HB 2445, SB 107, HB 2659), Idaho (SB 1390), Kansas (SB 406), and Tennessee (HB 2060). More on these bills can be found in Pipho (1976).

7. California passed SB 1112 in 1972 and SB 1243 in 1975. The two acts combined create the California High School Proficiency Test. Sixteen- and seventeen-year-olds are awarded a high school diploma if they pass the test and receive their parents' permission. Colorado would allow local boards of education to impose as gradua-

tion requirements a special proficiency test as well as a 12th-grade education (SB 180). Florida has passed CSSB 340, which permits the use of high school equivalency exams for students 16 years old. A Standards of Quality Act (HB 256) was recently passed by Virginia. Minimum objectives in reading and mathematics are to be established by 1978. These bills are discussed in more detail in Pipho (1976).

8. Consider just the 1970 Harris study. Estimates of the number of illiterates 16 years old and over are reported for each of three levels of education: between 0 and 8 years, between 9 and 12 years, and anything over 12 years. Using census figures (U.S. Bureau of the Census, 1972), it is possible to estimate the average educational attainment of those individuals within a given level of education. The estimated averages are 6.31, 11.21, and 14.97. The third estimate is lower than it should be. The census tables used did not report educational attainment after college by year. The sample after college was simply weighted by a factor of 17. In other words, it was assumed that the average person who remained in school after college did so for only 1 year. Commonsense suggests that this is an underestimate. Equations of the form $y=a/x + b$, $y=a/2x^2 + b$, and $y=a/x^3 + b$ were all fitted to the data. The best fit using R^2 was then selected to arrive at the predicted values in table 1.

9. The U.S. Bureau of the Census uses the term "years of school completed" to refer to what might ordinarily be called grade completed. Throughout the report years of school completed is to be taken as synonymous with grade completed.

10. A number of different ways of arriving at estimates of illiteracy rates are developed in the 1971 Harris study. It was decided that for the purposes of this paper it would be best to use the estimates based on percentage correct. Comparisons between the two Harris studies are easier to draw. Furthermore, the percentage-correct estimate (with equal weights attached to each item) is not subject to a number of criticisms that are applicable to the estimates Harris argues for. Harris argued for an estimate derived from an unequal weighting of the items, with the most difficult items weighted most heavily. This method seems misguided for at least two reasons: First, items should be differentially weighted on the basis of their relation or importance to functional literacy. However, there need not be any consistent relation between an item's difficulty and its importance to functional literacy. However, there need not be any consistent relation between an item's difficulty and its importance to functional literacy. An examination of the items on the Harris test suggests that the items that appeared most difficult may have been least important to the struggling functional illiterate. Common sense suggests that the functional illiterate is going to find most important just those items which are easiest in the general population. Second, the method of weighting may well guarantee a never-to-be-reached goal. If the items are sufficiently difficult, some part of the population will always appear to perform at an arbitrarily low level. Without weighting, an individual might get 99 percent of the items correct. With weighting, this same individual could conceivably get none of the items correct.

11. The estimates in table 1 are taken from the predicted illiteracy rate, not the reported illiteracy rate. Therefore, the predicted illiteracy rates may differ from the reported illiteracy rates. In the present case, the predicted APL rate is 13 percent, while the reported APL rate is 11 percent.

12. Figures for ETS were arrived at as follows. ETS reports scores on an item-by-item basis. For example, under education it reports the percentage of the population with less than 9 years of school that answered an item correctly, the percentage of the population with more than 8 and less than 13 years of school, the percentage of the population with more than 12 and less than 16 years of school that answered an item correctly, and the percentage of the population with

more than 15 years of school that answered an item correctly. There are 17 items in a book, and each person was exposed to all items. There were 10 books altogether, but no person saw more than 1 book. The literacy rate was established by averaging the group score over 51 items (for books, 1, 3, and 5) in each of the levels of education. Thus the literacy rate is the percentage of the population which can be expected to get an item correct. The illiteracy rate is simply the percentage of the population which can be expected to get an item incorrect. As an absolute measure of illiteracy rates, such a procedure is not easily interpretable. However, when comparing two illiteracy rates, such a procedure does make sense. This is why ETS results are only used when comparisons are being made.

13. Assume that all of the error in the college population is due to such factors as fatigue and boredom. The illiteracy rate in the college population is small enough to support the reasonableness of such an assumption. Let N_3 represent the number of individuals in the best educated level; let N_1 represent the number of individuals with a 12th-grade education; and let N_2 represent the number of individuals with educations between the best educated and those with a 12th-grade education. Let I_1, I_2, and I_3 represent the illiteracy rates in these populations. (The illiteracy rate for individuals completing only 12 years of schooling is simply I_1 -- I_3. The illiteracy rate for high school graduates is slightly more complicated.) The adjustments are based on the formula:

$$(I_1N_1 + I_2N_2 - I_3(N_1 + N_2))/(N_1 + N_2 + N_3)$$

This formula is based on the assumption that the reduction in illiteracy rates after high school is almost completely the result of self-selection (at least when one considers the population overall). Therefore, it is acceptable to add only I_2N_2 where otherwise one would add I_1N_2. The only illiteracy rate that would change if the above assumption is without substantial merit is the APL estimate. The after adjustment estimate would be 9 percent instead of the reported 6.9 percent.

14. This is not to say that the number of illiterates graduated by the high schools is low. An important distinction must be made between functional literacy and literacy. The literacy level of a population can be measured without knowledge of the reading and writing demands placed on the population by society. The functional literacy level can be measured only with the knowledge of print demands. A population can be marginally literate, yet still functionally literate. For example, a population that reads at the fourth- and fifth-grade levels might be considered marginally literate. Yet, if the reading demands of the population rarely exceed the third-grade level, the population is clearly functionally literate.

15. In 1967 it was estimated that 7.0 percent of the white males and 9.4 percent of the white females between the ages of 16 and 17 were dropouts (U.S. Bureau of the Census, 1973). In 1973, it was estimated that 8.7 percent of the white males and 9.2 percent of the white females were dropouts. Therefore, approximately 8.2 percent of the 1967 cohort were dropouts and approximately 8.95 percent of the 1973 cohort were dropouts. We can use the 1967 dropout estimate for the 1971 Mini-Assessment of Functional Literacy (MAFL) group and the 1973 dropout estimate for the 1974 MAFL group. Suppose all 8.95 percent of the 1973 dropouts were illiterate. Then the 1971 average is a composite of the students who are potential dropouts (8.95 percent minus 8.2 percent), plus the dropouts, plus the nondropouts. The equation needed to calculate the change in the score by the removal of dropouts is

$$(.9105/.9180)\ (x) = 87.5$$

On solving for X, we find that the population that did not drop out had to have a score on the average of 88.2 percent. Therefore, the most that could be gained by the increase in dropouts of the group in school in 1973 is 0.7 percent. Again, it should be

pointed out that this is a conservative estimate, because it is based on the assumption that dropouts answered none of the MAFL items correctly.

16. Average educational attainment was computed as a weighted average of the years of school completed. If we let E be the average educational attainment of a cohort, and if we let n_1 be the number of individuals completing y_1 years of school, then: $E = (\Sigma n_1 y_1)/\Sigma n_1$. Since the Census reports classify everyone with an education beyond four years of college in the same category, some figure of educational attainment had to be rather arbitrarily selected for this group. Without anything else to go on, 17 was selected.

17. If we let p_{ijk} be the proportion of the sample in the i^{th} cohort seeing the j^{th} book and the k^{th} item, then the null hypothesis for a book is: $H_o\ \Sigma_k(p_{ijk} - p_{i'jk})/17 \geq 0$. And the null hypothesis over the entire population of items is simply: $H_o\ \Sigma_{jk}(p_{ijk} - p_{i'jk})/170 \leq 0$. We are assuming here that the i^{th} cohort is younger than the i'^{th} cohort.

18. Let i,j and k be as in footnote 17. Then, within a booklet the variance of $\Sigma_k (p_{ijk} - p_{i'jk})$ is simply:

$$\Sigma_k \mathrm{Var}(p_{ijk} - p_{i'jk}) + \Sigma_{k' > k} 2\mathrm{Cov}((p_{ijk}-p_{i'jk}),(p_{ijk'}-p_{i'jk'}))$$

The covariance term can be expanded to

$$\mathrm{Cov}(p_{ijk},p_{ijk'}) + \mathrm{Cov}(p_{i'jk},p_{i'jk'})$$

$$\mathrm{Cov}(p_{ijk},p_{i'jk'}) - \mathrm{Cov}(p_{ijk'},p_{i'jk})$$

We expect the second two covariance terms to be zero. That is, we do not expect a correlation between different groups on different items. Therefore, it seems safe to drop them from the computations. Similarly, when we expand the variance term in the above equation - $\mathrm{Var}(p_{ijk}-p_{ijk'})$ - we get a covariance term which we expect to equal zero - $\mathrm{Cov}(p_{ijk},p_{i'jk})$. Therefore, the variance of $\Sigma_k(p_{ijk} - p_{i'jk})$ we expect to be:

$$\Sigma_k(\mathrm{Var}(p_{ijk}) + \mathrm{Var}(p_{i'jk})) + \Sigma_{k < k} 2(\mathrm{Cov}(p_{ijk},p_{ijk'}) + \mathrm{Cov}(p_{i'jk},p_{i'jk'}))$$

We have not calculated the covariance terms in the above equation. Since we expect these terms to be positive, we will be more than likely to reject the null hypothesis when we should in fact accept it. When summing across books, we had to assume that any covariances which included terms from different books had expectation zero. Since the samples seeing the different books are themselves different, such an assumption again seems warranted.

19. Other situations can of course lead to an identity of predicted and obtained rates. The effectiveness of an elementary school education might increase, while the effectiveness of a secondary school education might decrease. Such a compensation, while interesting, is irrelevant to the hypothesis at hand. We are interested in the overall effectiveness of education. If changes in one level of education are compensated for by changes in another level, then for our purposes the overall effectiveness of education has not changed.

20. The sampling techniques more or less guarantee that the obtained estimate will be unbiased. We need to show that the predicted estimate is unbiased. Suppose we let c_j be the proportion of illiterates in the j^{th} cohort. Suppose we let s_i be the proportion of illiterates in the i^{th} level of education. Finally suppose we let e_{ij} be the proportion of individuals in the j^{th} cohort in the i^{th} level of education. Then,

$$c_j = \Sigma s_i e_{ij}$$

and

$$E(\hat{c}_j) = E(\sum \hat{s}_i \hat{e}_{ij})$$
$$= \sum E(\hat{s}_i \hat{e}_{ij})$$
$$= \sum E(\hat{s}_i) E(\hat{e}_{ij})$$
$$= \sum s_i e_{ij}$$

since s_i and e_{ij} are assumed independent (see below).

21. Suppose we let s_i be the proportion of illiterate individuals in the i^{th} level of education (I levels) and e_{ij} be the proportion of individuals in the j^{th} cohort and the i^{th} level of education. And suppose we let V_{si} be the error in our estimate of s_i, and V_{eij} be the error in our estimate of e_{ij}. Then,

$$\text{Var}(\sum_{i=1,I} s_i e_{ij}) = \sum_{i=1,I} ((E(s_i))^2 (E(V_{eij}))^2 + (E(e_{ij}))^2 (E(V_{si}))^2 + (E(V_{si}))^2 (E(V_{eij}))^2$$

if we assume: (1) $E(V_{si}) = E(V_{eij}) = 0$; (2) s_i and e_{ij} are independent; and (3) $s_i e_{ij}$ and $s_{i'} e_{j'j}$ are independent. Since the estimates of s_i and e_{ij} are obtained independently of one another the above assumptions seem reasonable enough.

22. For purposes of comparison with the APL and Harris studies, it was necessary to derive a criterion referenced measure of illiteracy for the ETS survey. The proportion of the items in a booklet which a particular cohort answered correctly less than 80% of the time was computed and averaged across the ten booklets. An identical procedure was used to derive the figures for levels of education.

23. The predicted score is based on average educational attainment over the population as a whole (see footnote 21). Consequently, the predicted value is overestimated when the average educational attainment within a level of education in a cohort is less than the average of the group. In other words, the predicted score for the 16- to 20-year-olds is arrived at on the basis of a figure that assumes a higher level of educational attainment within a level of education than actually occurs. This is most clear in the college group. The 16- to 20-year-olds are at the lower end of the distribution of individuals in the population with more than a high school education.

24. The adjusted predictions were derived in the following manner. The average educational attainment of individuals in each of the three levels of education was obtained and used as the independent variable. The percentage of illiterates within a given educational level was used as the dependent variable. The equation that best predicted illiteracy rates on the basis of education was $I_h = 270/(E_h)^2$.

I_h represents the illiteracy rates in the h^{th} level of education. E_h represents the average educational attainment within each of the three levels of education reported by the 1970 Harris study. This gives the unadjusted illiteracy rate in each cohort. In other words, for any one cohort the unadjusted illiteracy rate is

$$c_i = (I_1 N_{1i} + I_2 N_{2i} + I_3 N_{3i})/(N_{1i} + N_{2i} + N_{3i})$$

C_i represents the i^{th} cohort. N_{hi} represents the number of individuals within the h^{th} level of education and in the i^{th} cohort. To get the adjusted illiteracy rates in each cohort, we must base our estimate on the average educational attainment of individuals within the i^{th} cohort in the h^{th} level of education. The adjusted illiteracy rate can then be expressed as $I_{hi_{th}} = 270/(e_{hi})^2$. And the adjusted illiteracy rate for the i^{th} cohort is simply

$$C_i = (I_{1i} N_{1i} + I_{2i} N_{2i} + I_{3i} N_{3i})/(N_{1i} + N_{2i} + N_{3i})$$

The unadjusted illiteracy rates, starting with the youngest cohort, are 2.16, 2.08, 2.58, and 3.79. The adjusted illiteracy rates are 2.17, 2.02, 2.50, and 3.86.

25. We are using illiteracy rate as an index of concern. Other indices are of course possible. For example, one might choose the absolute number of illiterates within a population as a proper index of concern. In the present case, the two indices point to the same population. There are more functionally illiterate repeaters than non-repeaters, and the illiteracy rate among repeaters is much higher than the illiteracy rate among non-repeaters.

26. The results (illiteracy rates) are not reported as a function of the number of years an individual has been held back in school. Rather, illiteracy rates are reported across levels of education by age. One can infer with some justification that the 12-year-olds reported in the fifth grade are in general 2 years behind, that the 12-year-olds reported in the sixth grade are in general 1 year behind, and so on. Given these assumptions, the illiteracy rate for 12-year-olds in the sixth grade should be an underestimate of the illiteracy rate for 12-year-olds who have stayed back a year. The illiteracy rate for 12-year-olds in the sixth grade is a function of the illiteracy rate among individuals who have stayed back a year as well as individuals who started school a year late.

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Appendix

The following section describes the methods and findings of several studies which attempted to measure the level of illiteracy in American society. We shall briefly assess the validity and usefulness of each study.

A-1. SIMPLE MESSAGE

1.1. Definition and Criteria

The U.S. Bureau of the Census (1971) defines a literate as one able to read and write a simple message in any language. Two measures or indexes of literacy are used: grade completed and self-report. Individuals who have completed or gone beyond the sixth grade are automatically classified as literate. Individuals with less than a six-grade education are asked the question: "Can you read and write a simple message in any language?" If the person answers, "yes," he or she is classified as literate; if, "no," as illiterate.

1.2. Estimates: The History of Illiteracy

As table A-1 shows, there were 20 illiterates for every 100 citizens in 1870, while almost a century late (1969) there was only 1 illiterate for every 100 citizens. The March 1974 Census Report points to a continuing reduction in the number of illiterates. Since 1969, the number of individuals 14 years old and over who have not completed the sixth grade has decreased by 272,000 while the total number of individuals 14 years old and over has increased by 5,250,000. Given similar conditions, it is possible to estimate the present number of illiterates at 0.93 percent of the population.[1] Roughly 1 in every 110 individuals 14 years old and over is now illiterate.

1.3. Illiteracy Rates and Educational Attainment

While almost 60 percent of those with no years of schooling report themselves as illiterate, only 2 percent of those who have completed 5 years of schooling so report themselves. The fact that 11 percent of those who have completed the third grade are now illiterate suggests (although it certainly does not prove) that individuals may lose the ability to read and write if they have exercised this ability only early in life and for a limited time. Regardless, we do find a strong relation between illiteracy rates and educational attainment (see table A-2). A discussion of this relation is pursued further in the next section.

1.4. Illiteracy Rates and Age

In 1969, only 0.3 percent of the population between the ages of 14 and 15 was classified as illiterate. The percent illiterate slowly increases as the age being

considered increases, until at ages 65 and over we find approximately 10 times as many illiterates as between the ages of 14 and 15. A quick glance at the Census Bureau report on educational attainment (U.S. Bureau of the Census, 1974) reveals the reason for this discrepancy (table A-3). Almost 14 percent of the population between the ages of 65 and 74 have not completed the sixth grade. Only 1.5 percent of the 14- and 15-year-olds have not completed the sixth grade. Thus, as one might expect, the decrease in the percentage of illiterates across the different age groups is almost a direct function of the decrease in the percentage of individuals having less than a sixth-grade education.

1.5. Illiteracy Rates and Race

The percentage of black illiterates was roughly five times the percentage of white illiterates in 1969. This disparity is almost entirely the result of differences in the literacy rates of adults 25 years and older. The percentage of black illiterates in the 14- to 24-year-old cohort is almost identical to the percentage of white illiterates in a similar cohort (U.S. Bureau of the Census, 1971).

1.6. Prospects and Predictions

It is possible to identify that portion of the population which accounts for the majority of today's illiterates. As reported above, this majority occurs at the intersection of certain subpopulations of given age, race, and educational attainment.

First, consider the contribution of older adults to the overall estimate of illteracy. It will be remembered that 3.5 percent of the population 65 years old and over is illiterate. This is roughly 46 percent of the entire illiterate population. In other words, nearly half of today's illiterates are 65 years old and over. If we consider the 45-year-old-and-over population, fully 80 percent of the entire illiterate population is accounted for.

We can further identify the above group of illiterates. More than 16 percent of the blacks 65 years old and over are illiterate; more than 5 percent of the blacks between 45 and 65 years of age are illiterate. This means that roughly 30 percent of the illiterates 45 years old and over are blacks. The reduction in the number of illiterates in the younger cohort (from 16 percent to 5 percent) parallels the reduction in the percentage of blacks who have not completed the sixth grade. Over 47 percent of the blacks 65 years old and over have not gone beyond the fifth grade, while only 21 percent of the 45- to 64-year-old cohort has not gone beyond the fifth grade.

A similar trend can be observed among whites. While 2.3 percent of the whites 65 years old and over are illiterate, only 0.7 percent of the 45- to 64-year-old whites are illiterate. The proportion of whites 65 years old and over who have not completed the sixth grade stands at 13 percent. The proportion of whites between the ages of 45 and 64 who have not completed the sixth grade stands at 4.6 percent. The reduction in the number of white illiterates by a factor of 3 is paralleled by a similar reduction in the number of whites not completing the sixth grade.

In short, the majority of illiterates are 45 years old and over. A disproportionate number of the illiterates are black. The number of black and white illiterates in the 45- to 64-year-old cohort is only 30 percent of the number of illiterates in the cohort 65 years old and over. This reduction is almost totally accounted for by the decrease in the number of individuals who have not completed the sixth grade.

If the level of educational attainment does not decrease from its present high among 19- to 24-year-olds, the number of illiterates 50 years hence should be but a tiny fraction of the present number of illiterates. It will be remembered that only 0.3 percent of the 14- and 15-year-olds are illiterate. This means that only 30 percent of

this population who have completed less than the sixth grade report themselves as illiterate. If we assume that a similar percentage of the individuals in the 16- to 17- and 18- to 19-year-old cohorts with less than a sixth-grade education are illiterate, then roughly 0.1 percent of the population in this age range is illiterate. The percentage of illiterates in the older cohort drops because the number of individuals who have not completed the sixth grade disproportionately decreases.

In short, while today 1 out of every 100 individuals can be classified as illiterate, in the future only 1 out of every 1,000 individuals 14 years old and over will be so classified.

1.7. Comment and Critique

The criterion and data-gathering process are inadequate for estimating both literacy (general reading and writing ability) and functional literacy. One has no clear indication of what constitutes a simple message. Therefore, one cannot say what the individuals having less than a sixth-grade education can read and write, either in general or in specific.

Though it is difficult to say what the individuals with less than a sixth-grade education who reported themselves as illiterate can do, it is somewhat easier to say what the individuals with at least a sixth-grade education can do. The usefulness of educational attainment as a measure of literacy is explored in the next section.

TABLE A-1.

Percent Illiterate in the Population, by Race, 1870 to 1969

(Data for 1870 to 1940 are for the population 10 years old and over; data for 1947, 1952, 1959, and 1969 are for the population 14 years old and over).

Year	Total	White	Negro and other races
1969	1.0	0.7	3.6[1]
1959	2.2	1.6	7.5
1952	2.5	1.8	10.2
1947	2.7	1.8	11.0
1940	2.9[2]	2.0[2]	11.5[2]
1930	4.3	3.0	16.4
1920	6.0	4.0	23.0
1910	7.7	5.0	30.5
1900	10.7	6.2	44.5
1890	13.3	7.7	56.8
1880	17.0	9.4	70.0
1870	20.0	11.5	79.9

[1]Negro only in 1969.

[2]Estimated.

Source: U.S. Bureau of the Census (1971).

TABLE A-2.
Percent Illiterate of Persons 14 Years Old and Over, by Years of School Completed and Sex: November 1969 (Civilian Noninstitutional Population)

Years of School completed	Both sexes	Male	Female
No school years	57.4	57.0	58.3
1 year	46.6	48.4	45.8
2 years	21.8	21.3	21.6
3 years	10.9	12.5	9.0
4 years	4.5	3.6	5.4
5 years	2.3	3.1	1.4
Total	1.0	1.1	1.0

Source: U.S. Bureau of the Census, 1971

TABLE A-3.
Population Completing Between 0 and 5 Years of School by Age

Age	Total (thousands)	Percent
14-15	85	1.0
16-17	45	0.5
18-19	35	0.5
20-21	50	0.7
22-24	96	0.9
25-29	233	1.0
30-34	241	2.0
35-44	726	3.0
45-54	1,125	5.0
55-64	1,377	7.0
65-75	1,701	13.0
75+	1,583	21.0

Source: U.S. Bureau of the Census, 1974.

A-2. GRADE COMPLETED

2.1. Definition and Criteria

UNESCO defines those persons as literate who have acquired the essential knowledge and skills that enable them to engage in all those activities in which reading is required for effective functioning. The U.S. Army defines literates as persons capable of understanding the kinds of written instructions that are needed for carry-

ing out basic military functions and tasks. UNESCO, the Bureau of the Census, and the U.S. Army, although all defining literacy differently, have each suggested that a minimal level of literacy or functional literacy is equivalent to the completion of a set number of years of school (between 4 and 6). The Division of Adult Basic Education of the U.S. Office of Education has defined the educationally disadvantaged population as those individuals 16 years of age and older who have had less than 8 years of formal schooling.[2]

2.2 Estimates: History of Educational Attainment

The average number of years of school completed by persons 25 years old and over has steadily climbed since 1940. In 1940, the median stood at 8.6. In 1974, the median stood at 12.3. This represents an increase of almost 50 percent in well under half a century (table A-4).

TABLE A-4.
Population 25 Years Old and Over Completing More Than 5, 8, 12, and 16 Years of School in 1940, 1950, 1962, and 1974[1]

Years of school completed	1940 (8.6)[2]	1950 (9.3)	1962 (11.4)	1974 (12.3)
5+	86.3[3]	88.9	92.2	95.6
8+	67.8	72.5	80.1	88.0
12+	24.5	34.2	46.3	61.2
16+	4.6	6.2	8.9	13.3

[1]U.S. Bureau of the Census, 1974.

[2]Median years of school completed.

[3]Figures reported as percent, e.g., 86.3 percent of the population 25 years old and over in 1940 completed at least 5 years of schooling.

That percentage of the population 25 years old and over with less than a fifth-grade education has dropped from 14 percent in 1940 to 4 percent in 1974. While 32 percent of the population had not gone beyond the eighth grade in 1940, only 22 percent had not passed beyond the eighth grade in 1974. A full three-quarters of the population had not completed high school in 1940. In 1974, only 39 percent of the population had not yet completed high school. Finally, while over 95 percent of the population had not gone through 4 years of college or more in 1940, only 87 percent had not completed college in 1974 (table A-4).

The biggest increases in educational attainment were registered in the groups completing at least a high school and at least a college education. The percentage of the population completing more than a high school education has increased almost 2½ times since 1940. The percentage of the population completing at least a college education has increased almost three times since 1940.

Two groups showed large decreases in size. The percentage of individuals completing less than 5 years of school dropped from 13.7 percent to 4.4 percent. The percentage of individuals completing less than a high school education dropped from 75.5 percent to 38.8 percent.

The above figures should be encouraging to organizations measuring functional literacy in terms of educational attainment. It will be remembered that people in adult basic education concluded that at least 8 years of schooling were necessary

before individuals could be considered literate. Using this measure, the number of literates has risen from 68 percent of the population 25 years old and over in 1940 to 88 percent of the same population in 1974.

2.3. Educational Attainment and Age

As one would expect, average educational attainment decreases when plotted against age. While less than 2 percent of the 20- and 21-year-olds have not completed the eighth grade, over 30 percent of those 75 years old and over have not completed the eighth grade. The percentage of the population completing less than the 8th grade and less than the 12th grade is presented for selected age and race cohorts in table A-5.

TABLE A-5
Population 14 Years Old and Over Completing 0-8 and 0-12 Years of Schooling by Age, Race, and Spanish Origin

	Level of Schooling							
	Less than 8th grade				Less than 12th grade			
Age	Total	White	Black	Spanish	Total	White	Black	Spanish
14-15	27.7	26.3	37.5	39.1	99.9	99.9	99.9	100.0
16-17	2.4	2.0	5.0	6.1	97.6	97.5	98.3	98.5
18-19	1.5	1.4	2.4	9.5	35.7	33.6	50.6	58.1
20-21	1.9	1.8	1.9	14.5	16.4	14.7	28.2	44.0
22-24	2.4	2.3	3.8	12.1	16.2	14.7	28.0	38.2
25-29	3.4	3.2	5.2	22.8	18.0	16.7	31.7	47.6
30-34	4.2	3.8	7.3	24.7	22.1	20.4	38.2	51.9
35-44	7.3	6.4	14.6	35.0	29.5	27.1	51.0	61.6
45-54	10.0	7.9	28.1	42.3	37.1	34.1	65.1	69.9
55-64	16.3	12.3	45.0	54.9	50.1	47.2	77.9	82.6
65-74	24.9	21.1	63.3	67.5	63.4	61.0	88.5	85.9
75+	34.2	30.9	71.0	74.6	73.0	71.6	88.1	88.8
Total	10.8	9.4	22.0	31.0	40.9	40.5	60.2	65.7

Source: U.S. Bureau of the Census, 1974.

One might wonder how much of the present population 35 years old and older had returned to school in the years between 1962 and 1972 (the only years for which figures are available). In 1962, 8.4 percent of the 25- to 34-year-olds had completed less than the 8th grade and 35.7 percent had completed less than the 12th grade. In 1972, 7.9 percent of the 35- to 44-year-olds had completed less than the 8th grade and 33.3 percent had completed less than the 12th grade. In both cases, a decrease is noted. However, only the decrease in the percentage of individuals completing less than the 12th grade is statistically significant.

2.4 Race and Origin

Looked at overall, the statistics paint a rather gloomy picture of educational equality from the standpoint of educational attainment. While 9.4 percent of the white population 14 years old and over has received less than an eighth-grade education, over twice this percentage of the black population has received less than an eighth-grade education. And of those who report themselves to be of Hispanic

origin, over three times as many as the percentage of whites have received less than an eighth-grade education. While 40.5 percent of the white population 14 years old and over have received less than a 12th-grade education, over 60 percent of the black population and over 65 percent of the Hispanic population (people who report themselves to be of Hispanic origin) have received less than a 12th grade education.

The disparity between blacks and whites may disappear if we look at only the 16- to 29-year-old cohort and if we consider only those receiving less than an eighth-grade education (table A-5). The percentage of the Hispanic population is roughly between three and seven times the white percentage in the same age and educational category. Though it looks as if the disparity is decreasing, the samples are too small to yield reliable estimates.

In the 20- to 24-year-old cohort, the percentage of blacks completing less than a high school education is about two times the percentage of whites completing less than a high school education. The percentage of the Hispanic population in the same age and educational group is roughly three times the white percentage. A black is two times more likely than a white not to finish high school, given that he has completed the seventh grade. An individual of Hispanic origin is also two times more likely than a white not to finish high school, given that this individual has completed the seventh grade. Thus, the major educational gap between the white and Hispanic population occurs in the first seven grades.

2.5. Prospects and Predictions

It will be remembered that 10.9 percent of the population 14 years old and over have not gone beyond the 7th grade, and that at 40.9 percent of this same population have not gone beyond the 11th grade. It was also reported that 22 percent of the population 25 years old and over had less than an 8th-grade education, while 38.8 percent of this same population had less than a 12th-grade education.

Clearly, the number of illiterates will depend on the population base one chooses. While 14 seems too young, 25 seems too old. A large population of 14- and 15-year-olds have not had the time to finish the 8th grade, let alone the 12th grade. On the other hand, most individuals between the ages of 16 and 25 have long had functional literacy-like demands placed upon them. In order to achieve some balance, the population 16 years old and over will be the base population when considering the number of individuals with less than an 8th-grade education, and the population 20 years old and over will be the base population when considering the number of individuals with less than a 12-th grade education.

Recomputing with the different base, one finds that 9.7 percent of the population 16 years old and over has less than an eighth-grade education. Over 71 percent of this group consists of those 45 years old and over. Fully 95 percent of the above group are 25 years old and over. Looked at slightly differently, one finds that while 25 percent of the population 16 years old and over are between the ages of 16 and 24, only 5 percent of those having less than an eighth-grade education fall into this group. This translates as roughly 2 percent of the 16- to 24-year-old cohort having less than an eighth-grade education. On the other hand, more than 12 percent of the population 25 years old and over have less than an eighth-grade education. In short, when illiteracy is defined in terms of eighth-grade attainment, a large and disproportionate majority of the illiterates are 25 years old and over.

Suppose we use the illiteracy rate in the 16-24-year-old cohort to predict the illiteracy rate in the years to come. It was reported that approximately 2 percent of this population is classified as illiterate, i.e., as having less than an eighth-grade education. In 68 out of 100 cases, the real mean will lie between 2.7 percent and 1.5 percent; in 90 out of 100 cases, the real mean will lie between 3.2 percent and 0.5

percent. The former percentage, if applied to the entire population, represents almost 5 million individuals. The latter percentage represents close to 1 million individuals. Thus, if educational attainment does not seriously change over the next 50 years, there will be between 1 and 5 million illiterates.

Clearly, the above attempt to identify illiterates can be improved. Any massive programs to reduce illiteracy today would do well to develop a more detailed identification of the target population.

A partial identification of the illiterates in the 16- to 24-year-old cohort has already been made. It was pointed out that the differences between the black and white populations completing less than the eighth gade were either not significant or negligible. It was also pointed out that individuals within the Hispanic population were between three and seven times more likely to be illiterate than either blacks or whites.

Assuming no change occurs across demographic groups, roughly 76 percent of the illiterates will be white, 20 percent will be black, and 4 percent will be of Hispanic origin. This means that we can expect 1.9 percent of the white population to be illiterate, 3.3 percent of the black population to be illiterate, and 12 percent of the Hispanic population to be illiterate.

While 2 percent of the population is by no means a large percentage, one might still wonder why even this small percentage fails to make it beyond the seventh grade. We now consider this population in more detail. Approximately 46,000 males and 44,000 females between the years of 16 and 24 never receive any schooling whatsoever (table A-6). This represents 0.3 percent of the entire 16- to 24-year-old cohort, or 14 percent of the illiterates in this cohort.

If one looks just at 19-year-olds, one finds that among the males only 0.5 percent have completed 1 year of schooling or less, while almost 1 percent have completed between 5 and 7 years of schooling. A similar percentage of females in the 18-year-old cohort have completed between 5 and 7 years of schooling.

It seems important to know what this 1 percent figure represents. For again, while it is low as a percentage, it represents over 1½ million people 16 years old and over. First, consider the combined effect of mandatory attendance laws and promotional policy. In most States, children must attend school between the ages of 7 and 16. One out of every two individuals does not enter the first grade until his seventh birthday (*U.S. Fact Book*, 1976, table 182). This means that fully half the population could legally leave school after completing at most the ninth grade. Now it does not seem entirely unreasonable to suppose that 1 percent of the population or more have been held back two grade levels. And it seems even less unreasonable to believe that these individuals are just the ones who would be most likely to drop out.

When one considers the estimated number of handicapped individuals enrolled in public schools, the above logic seems even more compelling. In 1970, an estimated 4,752,000 individuals were classified under the general heading of handicapped (*U.S. Fact Book*, 1976, table 189). This means that 11 percent of the public school population in 1970 were classified as handicapped. Almost 3 percent of the public school population is classified as learning disabled.

In short, unless individuals are unconditionally promoted, it may not be possible within the law to provide everyone with an eighth-grade education. Some individuals might well have completed the eighth grade had they not dropped out. Other individuals may suffer from handicaps that make the equivalent of an eighth-grade education all but impossible given our present teaching methods and knowledge of learning disabilities.

Many of the comments made about the population receiving less than an 8th-grade education are applicable to the population receiving less than a 12th-grade

education. Differences between race and origin have already been looked at. Similar trends show with respect to age and educational attainment. Almost 36 percent of the population 20 years old and over have received less than a 12th-grade education. Only 16 percent of the population between the ages of 20 and 24 have not completed high school. (It should be mentioned that the 16 percent figure does not necessarily reflect a failure of either the educational system or individuals. As previously mentioned, the law in most States requires no more than 9 years of school.)

TABLE A-6.
Single Years of School Completed by Age and Sex: March 1975

Age & Sex	Total Pop.	Years of Schooling 0	1	2	3	4	5	6	7
Male									
16	2,068	2	0	0	0	0	2	20	34
17	2,124	8	0	3	0	2	4	8	18
18	1,955	8	0	2	5	0	0	7	8
19	1,923	9	0	1	3	0	6	4	17
20	1,953	8	0	3	0	0	10	14	10
21	1,798	5	0	3	8	5	0	3	8
22	1,785	0	0	0	0	0	5	13	8
23	1,721	3	0	0	3	0	6	10	20
24	1,697	2	0	6	0	0	1	17	11
Female									
16	2,091	2	0	0	0	0	0	4	15
17	2,017	1	0	0	0	0	2	8	10
18	2,086	7	0	0	0	0	5	6	17
19	1,992	8	2	0	0	0	2	8	7
20	2,031	3	1	0	2	5	0	12	12
21	1,906	5	0	0	2	0	3	21	11
22	1,852	4	0	0	2	6	0	12	6
23	1,877	4	0	3	0	0	5	10	14
24	1,740	2	0	0	0	3	11	12	9

Source: U.S. Bureau of the Census. Educational Attainment in the United States: March 1975 (Current Population Reports, P-20, No. 295). Washington, D.C.: U.S. Government Printing Office, 1976.

2.6. Comment and Critique

Knowledge of grade completed could be useful when looking at a large population. One could find the distribution of reading achievement among a sample of those completing a given grade. One could then estimate the number of individuals reading at various grade levels. If one is willing to make certain assumptions, estimates can be based on the present norms of reading achievement. This is done by Corder (1971).

Grade completed is by itself only a rough measure of achievement. For example, of those in the eighth grade, approximately 37 percent read at or below the seventh-grade level, and approximately 14 percent read at or below the fifth-grade level (Corder, 1971). Of those in the 10th grade, similar percentages read at or below, respectively, the 9th-, 8th-, and 7th-grade levels. In short, one should be duly cautious of using grade completed as a measure of achievement in the absence of additional information.

A-3 GRADE LEVEL EQUIVALENCIES

3.1 Definition and Criteria. Sticht is perhaps the only investigator who relates grade level equivalencies to a definition of functional literacy (see section on Project REALISTIC). He finds that reading grade levels of 7, 8 and 9 are attained by men performing at a satisfactory level on job proficiency in, respectively, the military occupational specialties of cook, repairman and supply clerk. Corder, in a report on functional literacy to the United States Office of Education, makes various estimates of literacy rates on the basis of several national reading achievement tests. He does not, however, tie these estimates to any definitions of functional literacy.

The following estimates and tables are obtained from a report by Corder (1971).

3.2 Estimates. Tables A-7, A-8, A-9 and A-10 illustrate some aspects of the reading problem based on norm-referenced tests. For the total U.S. population that enters the 12th grade, we can expect (by definition) half to read at grade level 12 and above, about 87% to read at or above grade level 8.0, and as many as 99% to read at or above grade level 5.0. Of those individuals who are in the eighth grade, about 90% can be expected to read at or above grade level 5.0 Extrapolating this figure to the total adult population with eight years of school would underestimate the reading level. The correct figure would be significantly larger than 10% below grade 5.0, since those who drop out of school are probably below average in reading. The total population with less than eight years of school (almost 13% of the population 14 years of age and over) undoubtedly reads at a much poorer level in terms of grade equivalent scores than the samples from which these data were derived.

Nevertheless, if we accept a grade equivalent of 5.0 as the standard for meeting social and literacy needs, about one percent of those with twelve years of education, three percent of those with ten years of education, thirteen percent of those with eight years of education, and thirty percent of those with six years of education will read below this standard.

If we accept the figure of 8.0 as a standard, then thirteen percent of those with twelve years of education, twenty-four percent of those with ten years, and fifty percent of those with eight years will fail to meet the standard.

Applying these rates to the distribution of educational attainment of those 14 years and over, it is estimated that there are about twelve-and-one-quarter million individuals reading below a grade equivalent of 5.0 and about forty-five million reading below an equivalent of 8.0.

3.3 Comment and Critique. Variations in the estimates of people lying at or below a given grade level equivalency are the result of several factors. The tests are often normed over different and unrepresentative samples of the population. For example, with respect to differing samples, imagine a test were normed over a representative sample of ten year olds, but an unrepresentative sample of eight year olds—in this case a less intelligent sample. The median score is then determined for the third

(eight year olds) and fifth grades (ten year olds). However, in this case the third grade median would fall below the national median. Therefore, if this test were given to a representative, national sample of third and fifth graders, we would find more third graders scoring above their median and more fifth graders scoring above the third grade median than would normally be the case. However, the percentage of fifth graders scoring at the median would remain the same. This is in contrast to a test normed over a homogeneous, but unrepresentative, sample. In this case, we would expect to find the national medians either uniformly above or below the test computed median.

The proportions in which items of varying dificulty are included within a test can also affect an estimation. Items can be more or less difficult either because the child does not have the requisite cognitive skills, or simply because the child has not been exposed to the necessary material. The higher the ratio of difficult to easy items, the greater the chance that children at the higher grade levels will score above children in lower grades; and, therefore, the greater will be our estimates of literacy rates among the older children.

One should be aware of the existence of floor effects, for they too can seriously distort our estimates. Extrapolating grade levels beyond a certain point (that point at which an individual can be expected by chance to attain a given score) could lead to an erroneous conclusion such as, no one reads below the fifth grade level who has completed at least tenth grade. In other words, on a hundred item test with four choices per item we can expect, all other things being equal, an individual to get twenty-five items correct by chance alone. If we find that fifth graders on the average get twenty-eight items correct, we would be quite surprised to find anyone scoring below the fifth grade level—even though by reading off the curve showing the distribution of scores around the eighth grade we would expect fourth graders to get only nineteen items correct.

Finally, because different tests tap different domains of reading behavior, and because no test taps all domains, certain tests will correlate more highly with one set of functional literacy tasks than other tests. How many tests measure "map reading ability" or abilities closely related to it?

Still, even with these reservations, grade level equivalents probably provide some of the best general measures of literacy and functional literacy skills currently available.

TABLE A-7

Distribution of Grade Equivalent Scores on Norm Referenced Reading Tests for 12th Grade Students[1]

	Percent at Grade Equivalent & Above							
Test	12th Grade	11th Grade	10th Grade	9th Grade	8th Grade	7th Grade	6th Grade	5th Grade
STEP II	50	55	68	77	87	94	97	99
CAT	50	62	79	84				
MAT	50	58	69	76				

[1]These percent distributions were derived from various data provided in the Test Publishers Manuals. They should be read as rough approximations since each Publisher differs in the manner in which grade equivalents are derived and the number of grades which they cover.

Source:
Norm Tables for the Sequential Tests of Educational Progress (II)
Norm Tables for the California Achievement Tests
Norm Tables for the Metropolitan Achievement Tests

TABLE A-8

Distribution of Grade Equivalent Scores on Norm Referenced Reading Tests for 10th Grade Students[1]

	Percent at Grade Equivalent & Above					
	10th Grade	9th Grade	8th Grade	7th Grade	6th Grade	5th Grade
STEP	50	63	74	86	94	97
CAT	50	66				
MAT	50	59				
CTBS	50	69	80	89	94	97

[1]These percent distributions were derived from various data provided in the Test Publishers Manuals. They should be read as rough approximations since each Publisher differs in the manner in which grade equivalents are derived and the number of grades which they cover.

Source:
Norm Tables for the Sequential Tests of Educational Progress (II)
Norm Tables for the California Achievement Tests
Norm Tables for the Metropolitan Achievement Tests
Norm Tables for the Comprehensive Tests of Basic Skills

TABLE A-9

Distribution of Grade Equivalent Scores on Norm Referenced Reading Tests for 8th Grade Students[1]

	Percent at Grade Equivalent & Above				
Test	8th Grade	7th Grade	6th Grade	5th Grade	4th Grade
STEP II	50	63	82	86	95
CAT	50	78	83	97	98
MAT	50	60	75	88	95
CTBS	50	68	76	86	

[1]These percent distributions were derived from various data provided in the Test Publishers Manuals. They should be read as rought approximations since each Publisher differs in the manner in which grade equivalents are derived and the number of grades which they cover.

Source:
Norm Tables for the Sequential Tests of Educational Progress (II)
Norm Tables for the California Achievement Tests
Norm Tables for the Metropolitan Achievement Tests
Norm Tables for the Comprehensive Tests of Basic Skills

TABLE A-10
Distribution of Grade Equivalent Scores on Norm Referenced Reading Tests for 6th Grade Students[1]

Test	Percent at Grade Equivalent and Above			
	6th Grade	5th Grade	4th Grade	3rd Grade
STEP	50	65	76	
MAT	50	70	83	98
ITBS	50	74	81	
CTBS	50	62	79	90

[1]These percent distributions were derived from various data provided in the Test Publishers Manuals. They should be read as rough approximations since each Publisher differs in the manner in which grade equivalents are derived and the number of grades which they cover.

Source:
Norm Tables for the Sequential Tests of Educational Progress (II)
Norm Tables for the Metropolitan Achievement Tests
Norm Tables for the Iowa Tests of Basic Skills
Norm Tables for the Comprehensive Tests of Basic Skills

A-4. LOUIS HARRIS: 1970

4.1. Definition and Criteria

Louis Harris and Associates (1970) conducted a study for the National Reading Council which attempted to assess the survival literacy skills in the Nation at large. Survival literacy skills were defined as the behaviors needed to complete applications for social security benefits, a personal bank loan, public assistance, medicaid, and a driver's license. The examiner filled out the forms for respondents unable to write. Background information on each of the respondents was obtained for occupational category, race, sex, age, marital status, years of schooling, and income.

Four thresholds of literacy were established: low survival—less than 70 percent correct; questionable survival—less than 80 percent correct; marginal survival—less than 90 percent correct; and likely survival—greater than or equal to 90 percent correct. Each form contained upwards of 20 questions or blanks to fill in. Questions left unanswered, or blanks not filled in, were counted as wrong.

4.2. Estimates

A sample of 1,685 individuals over the age of 15 were personally contacted and found willing to complete the application forms. Three percent of the population correctly answered less than 70 pecent of the questions. Two percent answered between 70 percent and 80 percent of the questions. Eight percent of the population answered between 80 percent and 90 percent of the questions. The remaining 87 percent of the population answered more than 90 percent of the questions. In terms of the above categories, 3 percent of the population were classified as being in the low-survival category, 5 percent in the questionable-survival category, 13 percent in the marginal-survival category, and 87 percent in the likely-to-survive category.

The percentages can be expressed in terms of number of people. An estimated 4.3

million individuals fit into the low-survival category, an estimated 7.1 million into the questionable-survival category, and an estimated 18.5 million into the marginal-survival category.

All three levels of illiteracy are largest in the South, largest for those with low incomes, higher for blacks than whites, highest for older respondents, slightly higher for men than women, lower for those born within the United States, and highest for those with less than 8 years of education. (It should be noted that the between-group comparisons are based on small numbers of people in some cases. The room for error is considerable.)

4.3. Prospects and Predictions

Today, fully 13 percent of the population answers less than 90 percent of the questions on the applications correctly. In the future, we have good reason to believe that this estimate will decrease by almost 40 percent. Only 9 percent of the individuals in the 16- to 24-year-old cohort answered less than 90 percent of the questions correctly (see table A-11).

4.4 Comment and Critique

Although the Harris study has been criticized on several counts, it must still be considered a landmark in the research on functional literacy. For the first time, behaviors that appear to bear a direct relation to the literacy demands of society were defined and subsequently measured. If nothing else, the study points to the tremendous effort that will have to go into the careful selection of survival-related literacy skills.

Though one can appreciate the goals of the Harris survey, one still has to examine its methods and procedures with a critical eye. Unfortunately, there are objections which should be considered. Fortunately, these objections would lower rather than raise the number of classifiable functional illiterates.

The objections center on form V (see figure A-1). First, it will be noticed that a disproportionately large percentage of the college-educated population answers more than 10 percent of the questions incorrectly. While 26 percent of the college-educated population falls into the marginal-survival category on form V, no more than 5 percent of this population falls into the marginal-survival category on any of the remaining four forms (see table A-12).

A quick glance at figure A-1 shows why the errors may be concentrated in form V. The information requested in form V is quite detailed. It seems reasonable to assume that some of the information cannot be recalled during the interview. Respondents were not asked to fabricate answers to questions they were willing to answer but could not answer because of some recall problems. Because no answer was counted as a wrong answer, many wrong answers may have been misclassified. They may well have been simple failures of recall.

This fact calls for a recalculation of the number of individuals falling within each of the survival categories, excluding form V figures from the calculation. The percentage of illiterates in each of the categories with and without form V is given below:

Category	With V	Without V
Low	3	1.00
Questionable	5	2.50
Marginal	13	7.25

The drop from 13 to 7 percent may appear slight, but the number of people counted as functionally illiterate is thus decreased by more than 8 million. Instead of 18.5 million illiterates, the estimate drops to 10.3 million illiterates.

A corresponding decrease should be noted in the prediction of future illiteracy rates. An estimate of 9.2 percent was given in the previous section. This figure should be reduced to 4.8 percent when considering only the first four forms.

TABLE A-11

Illiteracy Rate by Form, Age, and Level of Illiteracy

	Level of Illiteracy											
	More than 30% Incorrect				More than 20% Incorrect				More than 10% Incorrect			
	Age				Age				Age			
	16 to 24 (%)	25 to 29 (%)	30 to 49 (%)	50 and over (%)	16 to 24 (%)	25 to 29 (%)	30 to 49 (%)	50 and over (%)	16 to 24 (%)	25 to 49 (%)	30 to 49 (%)	50 and over (%)
Form I	•1	•1	•	2	1	2	1	4	3	5	5	12
Form II	1	1	2	4	2	4	3	7	5	9	9	19
Form III	•	1	1	1	2	3	3	4	9	7	8	9
Form IV	-	-	•	2	1	2	•	2	2	5	2	4
Form V	6	9	8	15	12	14	16	25	27	29	33	43
Average	1	2	2	5	4	5	5	8	9	11	11	17

1• = less than 0.5 percent.

Source: Louis Harris and Associates (1970).[3]

FIGURE A-1
Form V, Application for Medicaid

A. Person applying for medical assistance:

_____

(LAST NAME) (FIRST NAME) (INITIAL)

Address: _____

_____

B. Do you earn a salary or wage? _____ Are you self-employed? _____

If employed, write below:

Employer's name and address: _____

Total wages or income: _____ per (week, month, etc.) _____

How many hours per week are you usually employed? _____

_____

C. Is any payment for room and board or other contribution received from any other person who resides in the household? _____
If another person paying, answer the following:
Name of person making payment or contribution: _____

Amount paid: _____ per (week, month, etc.) _____

_____

D. Do you have cash savings or other liquid assets such as savings accounts, savings bonds, stocks, bonds, etc., or any claim pending for personal injury, disease, or disability? _____
If you have cash or other savings, answer the following:

Types of assets: _____

Name of bank, company invested in: _____

Type of policy: _____
(INDICATE WHETHER WHOLE LIFE, 20 PAYMENT LIFE, 20-YEAR ENDOWMENT, TERM INSURANCE, FAMILY PLAN, ETC.)

_____

F. Do you expect to incur any medical expenses within the next three months? ____

If yes, what type of medical service is required? _____

Estimated cost: _____

_____

G. Do you have any physical or mental handicap or disability? _____

If you have handicap or disability, write below:

Description of handicap or disability: _____

Date started: _____

PLEASE MAKE SURE ALL QUESTIONS HAVE BEEN ANSWERED. IF YOU ARE NOT SURE OF AN ANSWER TO ANY ITEM, DRAW A LINE THROUGH THE SPACE PROVIDED FOR THE ANSWER.

Source: Louis Harris and Associates (1970).[3]

TABLE A-12
Illiteracy Rate by Form, Education, and Level of Illiteracy

	More than 30% Incorrect			More than 20% Incorrect			More than 10% Incorrect		
	8th grade or less (%)	High school (%)	College (%)	8th grade or less (%)	High school (%)	College (%)	8th grade or less (%)	High school (%)	College (%)
Form I	2	1	•[1]	5	2	1	17	6	3
Form II	6	1	1	9	3	2	27	9	5
Form III	4	1	1	8	3	2	17	8	4
Form IV	4	•	1	5	1	1	8	3	2
Form V	20	8	4	29	17	10	46	34	26
Average	7	2	1	11	5	3	23	12	8

[1] • = less than 0.5 percent.

Source: Louis Harris and Associates (1970).[3]

A-5. BRIEF TEST OF LITERACY

5.1 Criteria

The Brief Test of Literacy was administered as part of the Health Examination Survey during 1966 to 1970 (Vogt, 1973). The Health Examination Survey is one of the major programs of the National Center for Health Statistics, a division within the Public Health Service of the Department of Health, Education, and Welfare. The test was designed to differentiate between those with and those without the reading and writing skills at the command of the majority of fourth graders. An individual was classified as literate if he or she performed better than the bottom 20 percent of entering fourth graders.

The test used was developed specifically for the survey. The reading part of the test consists of seven short passages of 40 to 50 words. Each passage is followed by three separate multiple-choice questions, designed to tap an individual's comprehension of the passage. The test lasted for approximately 5 minutes. Measures were taken to make sure that time was not a significant factor.

The content of most passages on the test had little relation to the content of written materials encountered by the adult (Donlon, McPeek, and Chatham, 1968). Passages with adult content had to be excluded because of pretest results. These passages were simply too difficult for the majority of fourth graders. The passages failed to differentiate among the bottom 40 percent of fourth graders, i.e., only the best readers passed the functional literacy-like passages.

5.2. Estimates

The Brief Test of Literacy was administered to a representative sample of all noninstitutionalized American youths between the ages of 12 and 17. Of the 7,514 individuals selected for the sample, 6,768 were actually examined. Survey operations were begun in March 1966 and lasted through March 1970. The Brief Test of Literacy was the last in a long series of health-related examinations. The fact that the literacy test was the last one of the battery introduced a problem. In some cases

examination times had actually run out. The examiner was left to decide whether the examinee was indeed literate or not. Such judgments were rendered for about 200 youths, less than 3 percent of the sample.

Overall, it was found that 4.8 percent of the approximately 23 million noninstitutionalized youths 12 to 17 years old in the United States are illiterate, i.e., they read no better than the lowest 20 percent of entering fourth graders. Thus, an estimated 1 million teenagers are classified as illiterate under this definition. We can be confident that the estimated rate will lie within 1 percent of the above rate 90 percent of the time.

Distinct differences in rates of illiterates were found among differing social and economic groups of the population (table A-13). The differences between males (6.7 percent) and females (2.8 percent), between white males (4.7 percent) and white females (1.7 percent), and between black males (20.7 percent) and black females (9.6 percent) were all statistically significant. The illiteracy rates for black youths (15 percent) were several times larger than the illiteracy rates for white youths (3.2 percent). The relative size of this difference obtains at each of the sampled ages.

TABLE A-13

Estimated Illiteracy Rates (%) for Youths by Age, Race, and Sex: United States, 1966-1970

Race and Sex	Total	Age in years					
		12	13	14	15	16	17
All races	4.8	6.9	6.2	3.8	4.4	2.7	4.4
Male	6.7	9.4	8.7	5.5	6.2	3.5	6.5
Female	2.8	4.3	3.6	2.0	2.6	1.8	2.3
White	3.2	4.9	3.8	2.2	3.5	2.0	2.8
Male	4.7	6.6	5.8	3.4	5.2	3.0	3.8
Female	1.7	3.2	1.6	0.9	1.7	1.0	1.9
Black	15.0	19.3	21.7	14.5	11.0	7.0	14.8
Male	20.5	27.2	27.7	20.5	13.3	7.3	25.0
Female	9.6	11.2	16.0	8.9	8.6	6.8	5.0

Source: Vogt (1973).

The change in illiteracy rates with age is not consistent. Many of the observed ups and downs can be attributed to sampling error. Still, the absence of a marked decrease in illiteracy rates among older youths in the sample is a somewhat surprising result. The potential significance of this result is discussed in the next section. The change in literacy rates with grade placement is consistent and in the direction one would expect. (Table A-15) Those with less than a fifth-grade education (80.2 percent illiterate) fared considerably worse than those with a seventh-grade education (5.9 percent.) Those with a 12th-grade education (0.7 percent) fared better still.

Illiteracy was found to be related to income in the Brief Test of Literacy survey. The income groups were based on what was reported as total combined family income for the preceding 12 months. The rate of illiteracy declined from 14 percent

in the lowest income group (less than $3,000) to 0.3 percent in the highest income group ($15,000 or more). Geographic region also played a role in the determination of illiteracy rates. The difference between the rate for the South (9.9 percent) and any of the other regions was statistically significant.

5.3. Prospects and Predictions

It will be remembered that approximately 5 percent of the 12- to 17-year-olds in the present sample were classified as illiterate. It will also be remembered that changes in literacy rates were not strongly correlated with changes in age. While 4.4 percent of the 17-year-olds are illiterate, 4.8 percent of the target population are illiterate. The difference in the illiteracy rates of any one cohort is not significantly different from the illiteracy rates in any other cohort. This finding deserves some further comment.

The target population included all noninstitutionalized youths. Some of the 12- to 17-year-olds are in special placement. Others have yet to receive a fifth-grade education. Perhaps the 5 percent figure can be explained in terms of the above groups. We would expect a very high percentage of those with 0 to 4 years of schooling to be illiterate. Similarly, we know that most of the individuals in special placement are illiterate. The relevant data are presented in table A-14. It would appear that the suggested explanation of the stable illiteracy scores is wide of the mark. The percentage of individuals in either the 0-to-4 level of education or in the special placement group decreases with the age of the cohort being considered. While individuals in these two groups account for roughly half the illiterates in the youngest cohort, they account for only a small fraction of the illiterates in the oldest cohort.

If special placement were very near to ineffective and if we estimate the percentage of individuals in the older cohorts who have completed no more than the fourth grade as around 0.5 percent, we can account for roughly 40 percent of the illiterate population. The remaining 60 percent of the illiterate population (3 percent of the total population) is left unaccounted for. The information in table A-15 can be used to locate this population. Nor surprisingly, it is this population that has failed to progress at a "normal" rate. It is by and large the set of individuals who are behind in their schooling. In fact, the figures presented are lower than they would be if only those individuals were included who had stayed back 1 or more years. For the illiteracy rates for those 1 year behind their peers includes those who started 1 year late as well as those who stayed back 1 year. The same logic applies to those reported as being in a grade more than 1 year behind their peers. It appears that the schools are not meeting the educational needs of a certain small percentage of the population. The individuals within this population are passed along from year to year without showing any real signs of improvement.

5.4. Comment and Critique

The Brief Test of Literacy differentiated between the bottom two-fifths of the entering fourth graders. All individuals between the ages of 12 and 17 whose performance was better than the bottom fifth of the entering fourth graders were classified as literate. This included a little over 95 percent of the population. The remaining individuals, roughly 4.8 percent of the target population, were classified as illiterate. Data on the population of 12- to 17-year-olds, as well as on various social and economic strata, were collected and reported.

TABLE A-14
Unweighted Sample Frequencies by Grade Placement In School and Age; Health Examination Survey, 1966-70

Age	Total	Grade Placement										
		None-4th	5th	6th	7th	8th	9th	10th	11th	12th	Beyond 12th	Drop-out	Special place-ment
					Number								
Total	6768	25	74	390	1058	1261	1113	1072	875	577	108	147	68
12 years	1190	11	51	296	666	143	2	-	-	-	-	-	21
13 years	1208	6	16	74	273	697	122	3	1	-	-	-	16
14 years	1204	6	1	16	84	332	599	144	2	1	-	5	14
15 years	1116	1	4	4	22	70	296	576	117	3	2	12	9
16 years	1092	1	2	-	8	14	76	279	539	120	4	46	3
17 years	958	-	-	-	5	5	18	70	216	453	102	84	5

TABLE A-15

Estimated Rates of Illiteracy and Associated Standard Errors for Youths by Age and Grade Placement in School: United States, 1966-70

Age	Total	Grade Placement										
		None-4th	5th	6th	7th	8th	9th	10th	11th	12th	Beyond 12th	Drop-out	Special placement
	Rates per 100 youths												
Total	4.8	80.2	43.3	11.7	5.9	3.2	2.4	1.3	0.6	0.7	-	20.5	74.8
12 years	6.9	*	37.7	7.1	2.8	0.8	*	...	...	...	...	...	81.2
13 years	6.2	*	*	28.3	6.6	1.5	-	*	*	...	...	...	*
14 years	3.8	*	*	*	14.2	3.2	0.8	-	*	*	...	*	*
15 years	4.4	*	*	*	27.7	22.5	4.7	0.3	0.7	*	*	*	*
16 years	2.7	*	*	...	*	*	3.3	1.8	0.1	0.6	*	21.0	*
17 years	4.4	...	...	...	*	*	*	9.7	1.5	0.7	-	20.0	*
	Standard error												
Total	0.40	16.65	7.81	1.99	0.83	0.41	0.89	0.26	0.20	0.37	-	3.40	5.33
12 years	0.71	24.24	8.98	1.85	0.63	0.80	—	—	—	—	—	—	10.59
13 years	0.84	—	—	4.76	2.02	0.33	-	—	—	—	—	—	—
14 years	0.56	—	—	—	3.88	1.07	0.43	-	—	—	—	—	—
15 years	0.64	—	—	—	14.96	8.09	1.48	0.18	0.88	—	—	—	—
16 years	0.53	—	—	—	—	—	2.22	0.66	0.11	0.58	—	4.63	—
17 years	0.73	—	—	—	—	—	—	3.32	0.68	0.45	—	4.19	—

Source: Vogt (1973). Symbols: 1. Data not available —
2. Category not applicable ...
3. Quantity zero -
4. Figure does not meet standards of reliability or precision *

Two criticisms of the above effort are worth mentioning. These criticisms apply only to the Brief Test of Literacy considered as a measure of functional literacy. First, the use of the fourth grade as the cutoff point for functional literates and functional illiterates clearly requires some justification, but it is hard to see where one might find such a justification. Second, the use of the storybook materials also requires some justification. It is easy enough to believe that there is some relationship between performance on the Brief Test of Literacy and performance on measures such as that used in the Adult Performance Level Study, but the exact nature of the relation is unclear.

A-6. ADULT PERFORMANCE LEVEL PROJECT

6.1. Definition and Criteria

Since 1971 the Texas Education Agency and the Division of Extension of the University of Texas at Austin have been involved in one of the few national assessments of functional literacy. The assessment, funded by the Division of Adult Education Program of the Office of Education, is completed and the results are available (Adult Performance Level Project, 1973, 1975a, 1975b).

The items on the assessment instrument are intended to measure "the competencies which are functional to economic and educational success in today's society." The content of the items was arrived at on the basis of a number of different activities: a review of related literature and research; a survey of State and Federal agencies and foundations; a series of conferences on adult needs; and a series of semi-structured interviews with undereducated and underemployed adults.

The knowledge needed by functional literates was divided into discrete areas. Five general knowledge areas were identified: consumer economics; occupational (or occupationally related) knowledge; community resources; health; and government and law. Examples of specific objectives within the occupational knowledge area are included in figure A-2. The skills needed to function within each area fall into one of four categories: communication (reading, writing, speaking, and listening), computation, problem solving, and interpersonal relationships.

The final selection of items was based on the above concerns and the results of several field tests of the assessment instrument. Items that do not correlate with defined indicators of success (discussed below) were removed from the pool. Typically, each performance indicator or item was subjected to at least three tests and revisions.

Three levels of success or competency were defined. They were named simply APL 1, APL 2, and APL 3. Each level was defined in terms of income, education, and job status (see figure A-3). For example, the APL 1 or least competent adults received an inadequate education (8 years of school or fewer), had an inadequate income (poverty level or less), and were classified as having a low job status (unemployed or unskilled). Scores on the assessment instrument were defined in terms of the same three groups. The percentage of people within each APL level is reported. The method by which a raw score is categorized into one of the three APL levels is not entirely clear to this author. (The interested reader should see *Adult Performance Level Project*, 1975b.)

FIGURE A-2
Objectives for Functional Competency

Occupational Knowledge

GOAL: To develop a level of occupational knowledge which will enable adults to secure employment in accordance with their individual needs and interests.

1. **OBJECTIVE: To build an oral and written vocabulary related to occupational knowledge.**
2. **OBJECTIVE: To identify sources of information (e.g., radio broadcasts, newspapers, etc.) which may lead to employment.**
3. **OBJECTIVE: To define occupational categories in terms of the education and job experience required, and to know minimum requirements of given occupations.**
4. **OBJECTIVE: To be aware of vocational testing and counseling methods which help prospective employees recognize job interests and qualifications.**
5. **OBJECTIVE: To understand the differences among commercial employment agencies, government employment agencies, and private employers.**
6. **OBJECTIVE: To prepare for job applications and interviews.**
7. **OBJECTIVE: To know standards of behavior for various types of employment.**
8. **OBJECTIVE: To know attributes and skills which may lead to promotion.**
9. **OBJECTIVE: To know the financial and legal aspects of employment.**

Source: *Adult Performance Level Project* (1975b, p. A2).

FIGURE A-3
APL 1
(ADULTS WHO FUNCTION WITH DIFFICULTY)

APL1's are those adults whose mastery of competency objectives is associated with:

1. Inadequate income of poverty level or less
2. Inadequate education of 8 years of school or fewer
3. Unemployment or occupations of low job status

APL 2
(FUNCTIONAL ADULTS)

APL 2's are those adults whose mastery of competency objectives is associated with:

1. Income of more than poverty level but no discretionary income
2. Education of 9 to 11 years of school
3. Occupations falling in medial job status range

APL 3
(PROFICIENT ADULTS)

APL 3's are those adults whose mastery of competency objectives is associated with:

1. High levels of income or varying amounts of discretionary income
2. High levels of education, high school completion or more
3. High levels of job status

Source: *Adult Performance Level Project* (1975b, p. 5).

6.2. Estimates

Results are reported by APL level for each of the aforementioned knowledge and skill areas (table A-16). In addition, information by APL level is reported for selected variables: ethnicity, city size, size of household, and employment group. The data are reported in table A-17 and table A-18. Information on the general population is also available. Nearly one-fifth of the population (19.7 percent) are performing at the APL 1 level, while almost half the population (46.3 percent) are performing at the APL 3 level. In the words of the APL project report *(Adult Performance Level Project*, 1975a), "approximately one-fifth of the U.S. adults are 'functionally incompetent.' "

Education, family income, and job status all have strong and predictable relationships to APL competency levels. An individual with less than 4 years of education is 40 times more likely to be classified in APL level 1 than an individual with at least a college education. While 85 percent of the former group are in APL 1, only 2 percent of the latter group are in APL level 1. The relationship between family income and competency is almost as strong. While 40 percent of those with an income under $5,000 are in APL level 1, only 8 percent of those with an income of at least $15,000 are in APL level 1. It should be noted that one cannot conclude that these relations are attributable to anything other than the method by which the items were selected: Items were selected because they correlated with education, income, and job status.

TABLE A-16
Illiteracy Rates by Knowledge/Skill and APL Level

Area	APL Competency Levels		
	1 (%)	2 (%)	3 (%)
Occupational knowledge	19.1	31.9	49.0
Consumer economics	29.4	33.0	37.6
Government and law	25.8	26.2	48.0
Health	21.3	30.3	48.3
Community resources	22.6	26.0	51.4
Reading	21.7	32.2	46.1
Problem solving	28.0	23.4	48.5
Computation	32.9	26.3	40.8
Writing	16.4	25.5	58.1
Overall competency levels	19.7	33.9	46.3

Source: *Adult Performance Level Project* (1975a, p. 6).

TABLE A-17
Illiteracy Rates for Selected Demographic Variables by APL Level

Demographic variables[1]	APL Competency Levels		
	1 (%)	2 (%)	3 (%)
Education			
0-3 years	85	10	6
4-5	84	16	0
6-7	49	37	14
8-11	18	55	27
High school completed	11	37	52
Some college	9	27	64
College graduate plus	2	17	80
Family Income			
Under $5,000	40	39	21
$5,000-$6,999	20	44	36
$7,000-$9,999	24	39	37
$10,000-$14,999	14	34	52
$15,000 plus	8	26	66
Job status			
Unskilled	30	38	32
Semiskilled	29	42	29
Skilled	24	33	43
Clerical-sales	8	38	54
Professional-managerial	11	28	61
Age			
18-29	16	35	49
30-39	11	29	60
40-49	19	32	49
50-59	28	37	35
60-65	35	40	24

[1]Sex: Level 1, males 17, females 23; level 2, males 31, females 35; level 3, males 52, females 42.

Source: *Adult Performance Level Project* (1975a, p. 7).

TABLE A-18

Illiteracy Rates for Selected Demographic Variables by APL Level

Demographic variables	APL Competency Levels		
	1 (%)	2 (%)	3 (%)
Ethnicity			
White	16	34	50
Black	44	39	17
Spanish-surname	56	26	18
Other	26	41	33
Occupational status			
Employed	15	28	57
Unemployed	36	30	34
Housewives	27	38	35
Number in household			
1 person	21	23	56
2-3	20	35	45
4-5	19	31	50
6-7	21	33	46
8 plus	43	22	35
Region			
Northeast	16	36	48
North Central	15	42	43
South	25	37	38
West	15	35	50
Metropolitan areas			
1 million plus	21	39	40
Under 1 million	15	39	47
Suburb	21	32	47
Urban	14	29	57

Source: *Adult Performance Level Project* (1975a, p. 8).

6.3. Prospects and Predictions

There is some reason to believe that income alone should be the sole criterion by which one measures functional competence (such reasons will be discussed in more detail in the next section). Using the APL family income data and data from the U.S. Census Bureau, it is possible to estimate the number of individuals with less than a given income who fall into APL level 1.

There were approximately 55 million families (two or more related individuals living together) in the United States during the year 1973 (U.S. Bureau of the Census, 1975). Of the 189,361,000 individuals living within a family unit, 122,735,000

were over the age of 18. Twelve percent of this group, or 1,481,000 individuals, lived in families whose total income was less than $5,000. We know from the APL data that 40 percent of the adults earning less than $5,000 scored at the APL 1 level. Therefore, 4.8 percent of the adult population living in family units earning less than $5,000 performed at the lowest APL level. This corresponds to roughly 600,000 individuals.

The 4.8 percent figure is clearly a less discouraging estimate than that offered in the APL project report. But even it is somewhat inflated, at least from the standpoint of someone trying to predict future rates of illiteracy. It will be remembered that for individuals above the age of 25, years of schooling is inversely related to age. Many of the individuals earning less than $5,000 are older and consequently are less likely to have received an extended education.

6.4. Comment and Critique

Two aspects of the Adult Performance Level Project deserve further comment. First, something should be said about the process by which items were selected. Second, something should be said about the factors which entered into the determination of the three APL levels.

Items were selected on the basis of a long process of review and recommendation. This much is commendable. Items were also selected on the basis of a positive correlation to various indicators of success. Conversely, items were rejected because they failed to correlate positively with the various indicators of success. The selection and rejection of items on the basis of their correlation to the indicators of success is not without its problems. Items may be selected that should properly have been rejected. Or, more likely still, items may be rejected that should have been retained. There is no a priori reason for discarding items that fail to correlate positively with the APL levels. If an item tests an area of knowledge or a set of skills which are logically, though not empirically, important, the item should be included. To fail in this regard may be to exclude just those items that are most important to success.

Second, consider the manner in which the APL levels were defined. It will be remembered that job status, education, and income entered into the determination of the levels. This may well be undesirable. First, consider the use of job status, something that is likely to be with us forever. In effect, we can never reach a goal of 100 percent literacy if job status is used as one criterion of literacy. It does not seem that this factor alone should weigh so heavily. Second, consider the use of education. The items that differentiate the eighth from the ninth grader may have little to do with the demands on the adult reader and a great deal to do with the specific demands placed on the ninth grader. Commonsense suggests that we would want to apply the term functional literate to any individual who could meet the demands of the adult reader, regardless of whether this individual could do well in the ninth grade. In short, the use of education and job status is questionable.

A-7. ADULT FUNCTIONAL READING STUDY (ETS)

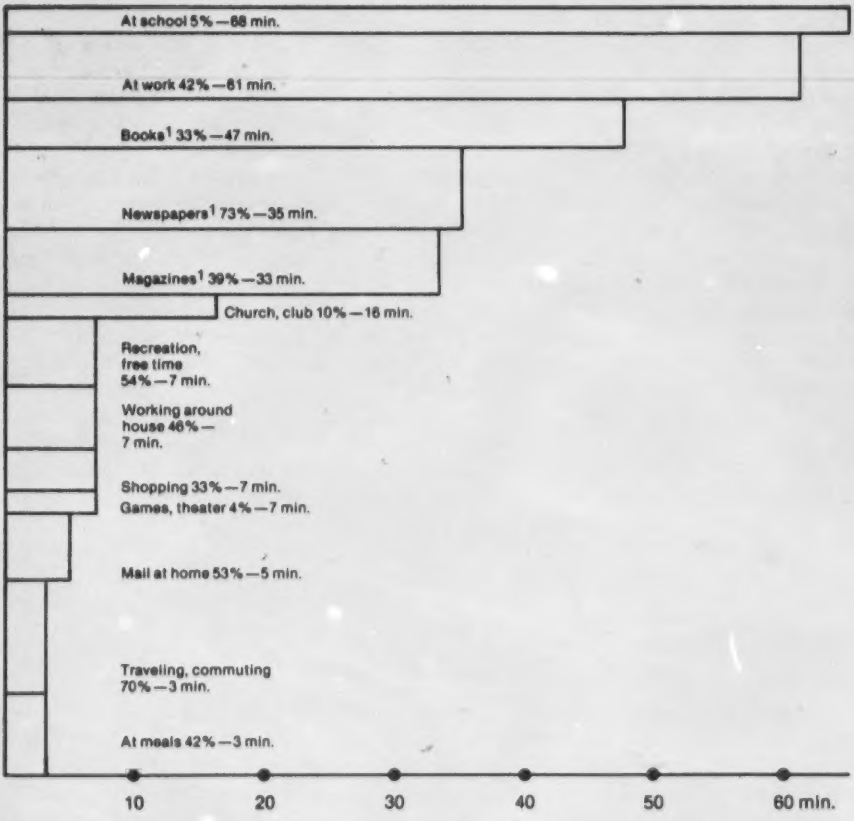
The Targeted Research and Development Program in Reading was launched by the U.S. Office of Education in the early 1970's. It was hoped that results from the program could serve some of the information needs of the newly formed Right to Reed Program. The Adult Functional Reading Study (Murphy, 1973, 1975), an initial project of the Targeted Research and Development Program, was assigned a threefold task: (1) to describe the reading behavior of American adults; (2) to construct a measure of reading achievement that required the reading behaviors outlined in the first task; and (3) to administer the measure to a sample representative of the population of individuals age 16 and over.

7.1. Reading Activities Survey: Definition, Criterion, and Estimates

A representative sample of individuals 16 and over were asked about their reading activities. Over 5,000 individuals were included in the sample. The respondents' reading activities were classified into 13 categories: book; newspapers; magazines; mail; meals; working around the house; school; work; traveling or commuting; shopping; club or church; theater, games or other public events; and recreational and free time. Each of these categories was in turn broken down into subcategories (Murphy, 1973; Sharon, 1972).

Respondents were asked to report their reading activities for 1 full day. They were asked to estimate the time spent on each activity and the importance of each reading activity in their lives. They were asked to indicate materials that proved particularly difficult to read. And finally, they were to report their position in regard to several socioeconomic indexes.

FIGURE A-4.
One day's reading of 5,067 adults, age 16 +


At school 5% — 68 min.
At work 42% — 61 min.
Books[1] 33% — 47 min.
Newspapers[1] 73% — 35 min.
Magazines[1] 39% — 33 min.
Church, club 10% — 16 min.
Recreation, free time 54% — 7 min.
Working around house 46% — 7 min.
Shopping 33% — 7 min.
Games, theater 4% — 7 min.
Mail at home 53% — 5 min.
Traveling, commuting 70% — 3 min.
At meals 42% — 3 min.
10
20
30
40
50
60 min.

Depth of bar approximates percent of sample; length = time.
[1]These types of reading were not included elsewhere.

Total reading time for the day preceding the interview averaged 1 hour and 46 minutes. A full 6 percent of those who could read spent less than 5 minutes reading, 71 percent spent an hour or more reading, and 6 percent spent more than 8 hours reading. Magazines were read by 39 percent of the sample for an average of 33 minutes. Newspapers were read by 73 percent of the sample for an average of 35 minutes. Books were read by 33 percent of the sample for an average of 47 minutes. The complete breakdown is reported in figure A-4.

It will be remembered that individuals were asked to indicate the importance of specific reading activities. This information, together with the information reported above, allowed for the computation of a derived-benefit index. The index for a specific activity is simply the proportion of the population that reads within a general activity who also rated the specific activity as very beneficial. For example, if 80 percent of the entire population read the newspapers (general activity) and if 16 percent of the entire population thought the comics (specific activity) were very beneficial, then (16/80) 100 or 20 would be the computed benefit index. The benefit or importance indexes for the subcategories with the category "newspapers" are reported in table A-19.

The use of the above index was favored over several other indexes. It was argued that an index should reflect not only the benefit of a given activity, but also the number of people engaged in the activity. The more people who felt a particular activity was important, the more important the activity should become. However, from this line of reasoning one does not necessarily arrive at the formula reported above for computing benefits. A simple alternative is discussed in the next section.

7.2. Reading Activities Survey: Comments and Critique

The Reading Activities Survey is the first major attempt to describe the reading habits and activities of adults. A wealth of information has been collected. Much of this information may be important in the construction of future measures of functional literacy.

Some precautions must be taken in interpreting certain of the data. There is no guarantee that a subject's recall of the time spent on a specific reading activity is correct. Nor is there any guarantee that the subject correctly recalled what had been read the previous day. Common sense suggests that more faith can be put in the estimates of what people read than can be put in the estimates of the time people spend reading. Perhaps any future efforts similar to the Reading Activities Survey should rely on more than common sense.

One can also question the adequacy of the formula for arriving at an index of benefit. It will be remembered that an argument was made to the effect that the index should reflect the number of individuals engaged in an activity who also rated that activity as important. This seems clear enough. But it is not clear why they went on to divide the number of individuals in a *specific* activity who rated the activity as very important by the number of people engaged in the *general* activity. A situation such as the following could conceivably arise. Suppose 50 percent of the population reads within general activity A, and 10 percent of the population rates specific activity 1 within A as very important. Further suppose that 100 percent of the population reads within general activity B and 10 percent of the population rates specific activity 1 within B as very important. The benefit indexes for Activities A1 and B1 are respectively 20 and 10. Yet, with respect to the entire population, both activities are equally important: 10 percent rated A1 as very important and 10 percent rated B1 as very important. In short, it is not clear from the survey report why we should consider A1 as more important than B1. It seems just as reasonable, if not more so, to consider A1 and B1 equally important.

The importance of a properly arrived at index of benefits should not be underestimated. For it is the rated value on this index that figures in the selection of items for the measure of functional literacy.

TABLE A-19
Analysis of Reader Activity for Newspaper Sections

Section	Percent readers	5 minutes or more	Socio-economic status of readers	Index of importance[1]
Main news	66	52	Average	43
Local news	55	41	Average	33
Editorials	38	25	High	18
Women's pages	37	21	Average	9
Sports	36	24	High	17
Comics	36	18	Average	6
Regular ads	35	15	Average	10
Classified ads	29	17	Average	12
TV-radio listings	27	8	Average	7
Financial news	22	12	High	13
Movie, book reviews	16	7	High	3
Magazine section	12	9	Average	4
Obituaries	7	3	Average	4

[1]See text for explanation of index.

Source: Murphy (1973, p. 25).

7.3. Item Construction: Comment and Critique

The Reading Activities Survey formed the substance of the first task of the Adult Functional Reading Study. With the completion of the survey, work on the second task could begin. The product of the second task was to be a measure of functional reading achievement. The selection of items for this measure was to be based on information gathered in the Reading Activities Survey. The items were to reflect the reading behaviors of American adults, and the items were to be associated with some benefits.

Further restrictions were put upon the selection of items. First, the content of the items was to be equally accessible to the majority of the population. The content of a task was not to be more familiar to one population than another. However, as the report on the Reading Activities Survey notes, this was a goal not often achieved, as one would expect in a society as heterogeneous as ours. Second, the difficulty of the tasks was to be a function of the difficulty of the stimulus materials, not of the difficulty of the questions that referred to the stimulus materials. The questions were not to draw upon information outside the stimulus materials.

The above guidelines and restrictions are not easy to meet. Consider the selection of materials within a specific activity. This selection is supposed to reflect the printed materials read by American adults. But the survey provides only categorical information. Samples of actual materials read by adults were not collected. An item chosen for a specific activity, such as "main news," may or may not be similar to what the average reader of the main news encounters.

If items are not necessarily representative of the printed materials within a specific activity, the item cannot be assumed to have the same benefit index as the specific activity. However, as far as one can tell, items are in fact assumed to have the same benefit index as the specific activity. The benefit index not only is computed somewhat questionably but appears to be applied more or less indiscriminately.

Oddly enough, there exist some grounds for believing that items were chosen that were not representative of what the average reader encounters. It will be remembered that the items were not supposed to favor any one subpopulation. However, an item that all subpopulations encounter is not necessarily an item representative of material read by the average reader.

There exist other equally important criticisms of the decision to make the items as accessible as possible. Benefits may not accrue to certain segments of society simply because they are unfamiliar with a restricted domain of written materials. To call the measure a test of functional literacy, and then to exclude items because the functional illiterate is unfamiliar with their content, seems strange.

The motivation behind the original decision to exclude items is not without its merits. Clearly, certain items could be important to only a limited segment of society. And clearly an understanding of these items may not be important to basic economic advancement (or whatever criteria one proposes). However, a policy of exclusions should not be applied without some forethought being given to the items being excluded.

Finally, one must question the adequacy of a general assessment instrument. By most accounts, functional literacy is a concept relative to the country in which one lives. It seems reasonable to assume that it is also relative to a given subpopulation. The literacy demands on one subpopulation may include only some of the demands on other subpopulations. A subpopulation could be functionally literate with respect to itself, but not with respect to other subpopulations.

7.4. Adult Functional Reading Study: Estimates

A functional literacy measure was constructed with the above restrictions in mind. Revisions in the measure were made after an initial pilot study. A total of 170 items were finally selected. Each individual in a sample of adults 16 years old and over was given 1 of 10 test booklets. Each booklet consisted of 17 items. Questions were read to respondents, and respondents were requested to circle or underline the information in an item which could serve as the answer to the question.

Results are reported on an item-by-item basis only. The number of individuals getting an item correct, the number getting an item incorrect, and the number not answering an item are all reported. It is not possible to determine how individuals fared overall. That is, one cannot estimate in general how many individuals scored below any given level. It is not clear from the report why the data were reported in such a way as to exclude this possibility.

Item-by-item results are also reported for 13 selected variables: sex, race, birthplace (U.S. or foreign), age, education, region, community, employment status, occupation, personal income, total family income, low income/race, and low income/age. One can go on to compute the average item score for each of the levels

within any of the above variables. This was done for education and age. Average item scores were computed by using the data in booklets 1, 2, and 3. A total of 51 scores entered into the average item score for a group.

The results are reported in table A-20. On the average, 86 percent of those with 16 or more years of schooling, 83 percent of those with between 13 and 15 years of schooling, 77 percent of those with between 9 and 12 years of schooling, and 59 percent of those with between 0 and 8 years of schooling answered an item correctly. The differences are not quite so dramatic when one looks across cohorts. On the average, 39 percent of the population 60 years old and older, 26 percent of the population between 30 and 59 years, 23 percent of the population between 20 and 29 years, and 28 percent of the population between 16 and 19 years are illiterate.

TABLE A-20
Illiteracy Rates by Age and by Education

Factor	Illiteracy rate (%)
Age	
16-19	28
20-29	23
30-59	26
60 +	39
Education	
0-8	41
9-12	23
13-15	17
16 +	14

Source: Murphy (1973c).

7.5. Comment and Critique

Item-by-item reports are useful in some respects. However, they are of little if any value in the present context. We would like to know the number of individuals who perform below a specified criterion overall. And we would like to know the number of individuals within a given level of a selected variable who score below criterion. Such estimates cannot be made given the display of the present data. In short, it is unfortunate that ETS chose this way of presenting the data.

Specific comments on other aspects of the study have for the most part already been detailed in earlier parts of this section. A general comment is in order. The ETS data, if they were reanalyzed, could well be one of the most reliable sources of available data. The ETS survey is based on responses from over 7,500 individuals. In comparison, the Harris survey is based on the responses of little more than 100 individuals.

A-8. NAEP AND MAFL

The Right to Read program commissioned the National Assessment of Educational Progress (NAEP) to undertake a nationwide assessment of functional literacy among 17-year-olds. Completed in 1974, the Mini-Assessment of Functional Literacy

(MAFL) is a close relative of earlier instruments administered by NAEP. Sixty-four out of 86 exercises on the MAFL were also part of the reading-assessment instrument administered in 1970. Scores on that set of items common to both the 1971 and 1974 instruments are reported and compared.

The MAFL exercises are reported to have been selected "to present the formats of reading materials we frequently encounter in everyday life and with which we must be able to cope if we are to function adequately" (Gadway and Wilson, 1974, vii). The MAFL staff went on to classify each exercise on the basis of both the format of the exercise and the behavior required to complete the exercise. Five formats and five behaviors were identified:

Category	No. of items in category
Formats	
I — Passages	38
IIA — Graphic materials: drawings, pictures, coupons	13
IIB — Graphic materials: charts, maps, graphs	11
IIC — Graphic materials: forms	10
III — Reference materials	14
Behaviors	
1 — Understand word meanings	12
2 — Glean significant facts	47
3 — Comprehend main ideas	8
4 — Draw inferences	16
5 — Read critically	3

The behaviors they have in mind are described in more detail in the supporting documents.

The scoring was done in one of three ways. One method involved computing the highest expected level of performance (HELP). Readers scoring at or above the 95th percentile on the CEEB reading test were given the MAFL. Their average score was the HELP score. The score for any one group is the average of the group divided by the HELP. This score is then called the mean p-value.

Another method involved the construction of a functional-literacy index. The mean p-value for 1971 converts to 1,000.0 index points. A mean p-value of 0.0 converts to an equivalent number of index points.

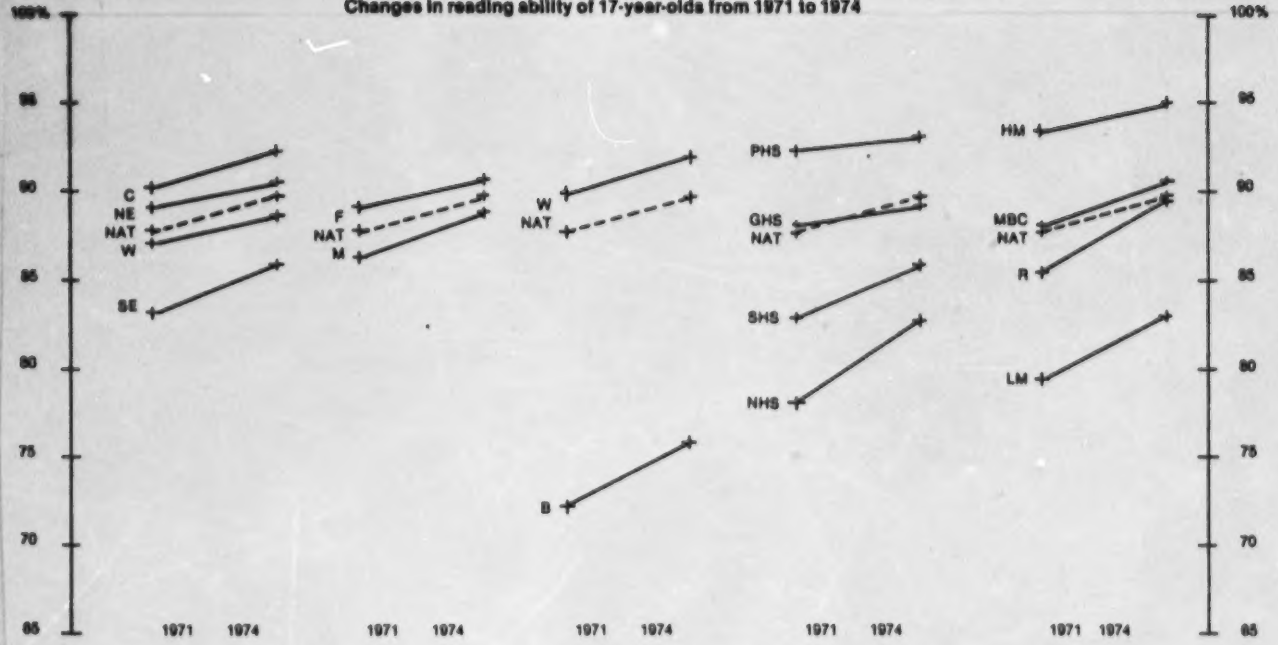
Finally, something called the percentage of maximum possible gain (PMPG) was reported. This is simply the change in the mean p-value for any one group from 1971 to 1974 divided by the difference between the HELP and the 1971 p-value for the group.

8.1. Prospects and Predictions

Data for five major demographic variables are reported: region, sex, race, parental education, and size and type of community. Results for both 1971 and 1974 are reported in table A-21 and figure A-5.

A national gain of 2 percentage points was registered in the years between 1971 and 1974. The largest gains were generally made by the groups with the most to gain: Blacks gained 3.59 percentage points, and whites gained 2.10 percentage points. The mean p-value of blacks in 1971 stood at roughly 72; the mean p-value for whites stood at roughly 89. The Southeast gained 2.73 percentage points; the

FIGURE A-5.
Changes in reading ability of 17-year-olds from 1971 to 1974



REGION

NAT—National
SE—Southeast
W—West
C—Central
NE—Northeast

SEX

M—Male
F—Female

RACE

B—Black
W—White

PARENTAL EDUCATION

NHS—No High School
SHS—Some High School
GHS—Graduate High School
PHS—Post High School

SIZE AND TYPE OF COMMUNITY

LM—Low Metro
ER—Extreme Rural
SP—Small Place
MC—Medium City
MBC—Main Big City
UF—Urban Fringe
HM—High Metro

Source: Gadway and Wilson, 1975.

Northeast gained 1.43 percentage points. The largest gains were registered by 17-year-olds who lived in families where the parents had not received a high school education. Large gains were also made by the extreme rural group.

If one assumes constant gains, the mean p-value for the various demographic groups can be predicted in the years ahead. Suppose we set 95 percent of the 1974 HELP as the national goal for all groups. Then we can estimate when a given group will reach this goal (table A-22). The Nation as a whole is expected to reach this goal in 1984. All demographic groups are expected to reach the goal before 1990.

TABLE A-21

Changes in Mean p-values, Functional Literacy Index Points, and Percentages of Maximum Possible Gain

Demographic factors	P_{05}-P_{02}	FLI_{05}-FLI_{02}	PMPG
National	+2.01	+22.9	16.37
Region			
Southwest	+2.73	+31.1	16.18
West	+1.56	+17.7	12.03
Central	+2.07	+ 2.36	21.04
Northeast	+1.43	+16.3	13.10
Sex			
Male	+2.49	+28.4	16.12
Female	+1.52	+17.3	13.97
Race			
Black	+3.59	+ 0.9	12.91
White	+2.10	+24.0	20.77
Parental education			
No high school	+4.65	+53.0	21.12
Some high school	+2.94	+33.5	17.09
High school graduate	+1.34	+15.2	11.02
Post high school	+0.78	+ 8.9	10.10
Size and type of community			
Low metro	+3.63	+41.4	17.60
Extreme rural	+4.11	+46.8	28.21
Small place	+2.39	+27.2	18.80
Medium city	+1.11	+12.7	9.73
Main big city	+2.56	+29.2	21.39
Urban fringe	+2.27	+25.9	20.67
High metro	+1.62	+18.5	24.40

Source: Gadway and Wilson, 1975.

TABLE A-22
Year in Which Illiteracy Problems Can be Overcome by Selected Demographic Variables

Group	1974 score[1]	Year goal attained[2]
National	89.5	1984
Region		
Southeast	86.0	1984
West	87.0	1989
Northeast	90.5	1979
Central	92.5	1979
Sex		
Male	86.0	1985
Female	88.5	1988
Race		
Black	77.0	1989
White	94.0	1975
Parental education		
No high school	83.5	1985
Some high school	86.0	1983
Grad. high school	89.5	1986
Post high school	94.0	1978

[1]Truncated MAFL: items shared by both 1971 and 1974 measures.
[2]Year 1974 average score is 95 percent of 1974 HELP.

Source: Raw data from Gadway and Wilson, 1975.

In 1974 there still existed substantial differences between groups. Students in the Southeast had a mean p-value of 88.8; students in the central United States had a mean p-value of 93.26. Students whose parents had not received a high school education had a mean p-value of 85.36; students whose parents had gone beyond high school had a mean p-value of 94.01. Students in the low metro communities averaged 87.17; students in the high metro communities averaged 95.89. Blacks had a mean p-value of 79.08; whites had a mean p-value of 93.16.

It will be remembered that five formats and five reading behaviors were identified. It may be of some importance to know which behaviors and which formats proved the most difficult for certain groups. We consider only the difference between blacks and whites in p-values (the numbers shown below):

	Universe	1	2	3	4	5
Formats	14.08	13.94	11.25	12.74	14.85	17.58
Behaviors	14.08	5.50	13.78	4.80	23.89	13.57

The difference between blacks and whites across formats is relatively constant. But the difference between blacks and whites across behaviors is very uneven.

A difference of almost 24 percentage points is noted for the behavior called "drawing inferences." Differences of more than 13 points are noted for behaviors labeled "comprehending main ideas and organization" and "reading critically." Only small differences are noted for the behaviors called "understanding word meanings" and "gleaning significant facts." One might want to argue that the latter two behaviors are the most important from the standpoint of functional literacy. In this case, the black-white difference is appreciably less than the difference over all formats: roughly 5 percentage points instead of the overall 14 percentage points. One might find all the behaviors consistent with one's interpretation of functional literacy. In this case, the performance data clearly point to those areas that should be the focus of future literacy projects.

8.2. Comments and Critique

The MAFL is something of an improvement over more general measures of reading achievement. Items on the MAFL were selected on the basis of their similarity to functional written materials. At the very least, the items enjoy a measure of face validity. Like most other measures, demographic information was collected along with test data. Unlike certain measures, something is known of the performance of various groups across certain formats and behaviors.

Finally, one should note the value of a HELP level. On the one hand, it makes good sense to gear percentages to something like a highest expected level of performance. Bad items do not necessarily drag down performance estimates. Some of the general tendency to make infrequent but real errors is also removed from performance estimates.

However, functional literacy is not simply a set of skills applied in a vacuum. Good standard readers, as defined by performance on a test such as given by the CEEB, are not necessarily good functional readers. Over 73 percent of the HELP readers could not answer a question which asked the reader to indicate the maximum amount an automobile insurance policy would pay if the policyholder injured another person in an accident. Such a question and exercise has some appeal from the standpoint of functional literacy. Certainly, we should use the HELP index with caution in such a case as the above.

The problems with the use of the HELP criterion are easier to understand and correct than the problems that may lie with the selection of MAFL items. There is no indication that items on the MAFL are representative of the domain of functional literacy tasks, either with any one region of the country or the Nation as a whole. Nor is there any indication that the weighing of items was attempted. That is, no attempt was made to verify the importance of one exercise relative to another. Yet certain reading demands clearly can be more important than others.

A-9. PROJECT REALISTIC

9.1. Definition and Criteria

In 1966 the U.S. Army initiated Project 100,000. Up to 100,000 individuals were to be let into the armed services who would previously have failed to gain entrance for reasons of health or measured intellect. The military needed to know how much, if any, literacy training these men would require. A sample of the Project 100,000 men suggested that much work lay ahead. Approximately 30 percent of the sample read below the fourth-grade level, while almost 70 percent read below the sixth-grade level.

By themselves, these figures mean little. The Army did not know the reading demands of the various occupational specialties it could expect the Project 100,000 men to enter. Nor did the Army know whether scores on standardized tests of reading achievement were good predictors of job performance. Therefore, the Army sought to obtain information concerning the literacy demands of military jobs and the predictive power of reading and other related tests.

Project REALISTIC (Sticht, Caylor, and Kern, 1971) was an effort designed to obtain the needed information. Funded by the Army, the project got underway sometime in 1968. Two criteria were used to judge the reading demands of Army jobs: the readability levels of manuals, books, etc.; and the scores on job reading-task tests, i.e., tasks or exercises based on the actual written materials in various Army jobs. Three measures of job performance or success were constructed: paper-and-pencil job knowledge tests; hands-on tests; job sample tests; and supervisor's ratings. Finally, interrelations among scores on traditional norm-referenced reading achievement measures, scores on the measure of job reading, and scores on the measure of job performance were considered.

9.2. Readability and Grade-Level Estimates

Readability estimates were made of written materials in the repairman's, supply clerk's, and cook's jobs. The readability estimate was compared with the average reading grade level of high- and low-aptitude men. Low-aptitude men were from the Armed Forces Qualification Test mental category IV. High-aptitude men were not in category IV.

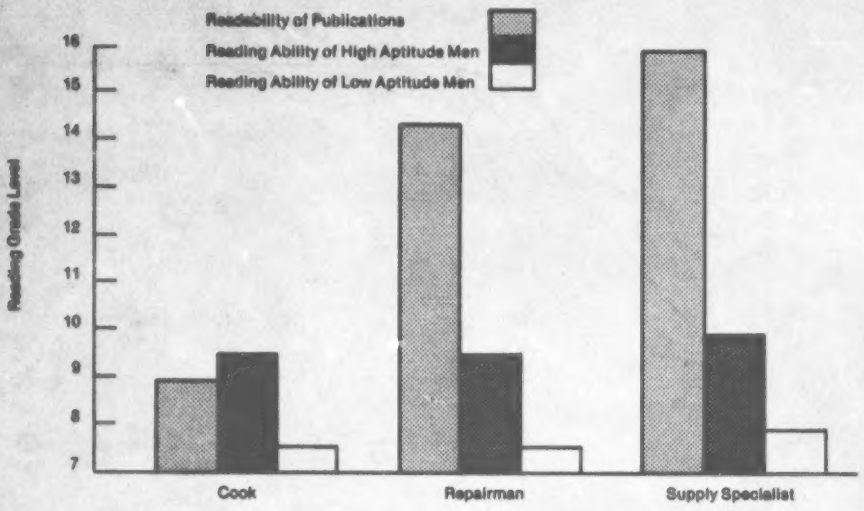
The reading difficulty level of materials in the repairman's job and supply clerk's job exceeded the average reading ability levels of high-aptitude men by some four to six grades (table A-23). The readability estimate exceeded the reading levels of low-aptitude men by some six to eight grades. The reading materials used by cooks, consisting primarily of recipes, were written at about the level of the high-aptitude men in the cook specialty (Vineberg, et al., 1971) (see figure A-6).

TABLE A-23.
Readability scores for publications in three Army jobs

MOS	Number of publications	Number of pages sampled	Range of Flesch readability levels—SGE[1]	Readability Readability SGE
Supply Specialist	11	64	8.5-16+	16.0
Repairman	8	244	7.0-16+	14.5
Cook	6	100	6.0-14.5	9.0

[1]SGE = school grade equivalent.

FIGURE A-6.
Readability of publications and reading ability of job incumbents



Source: Vineberg, et al. (1971, p. 48).

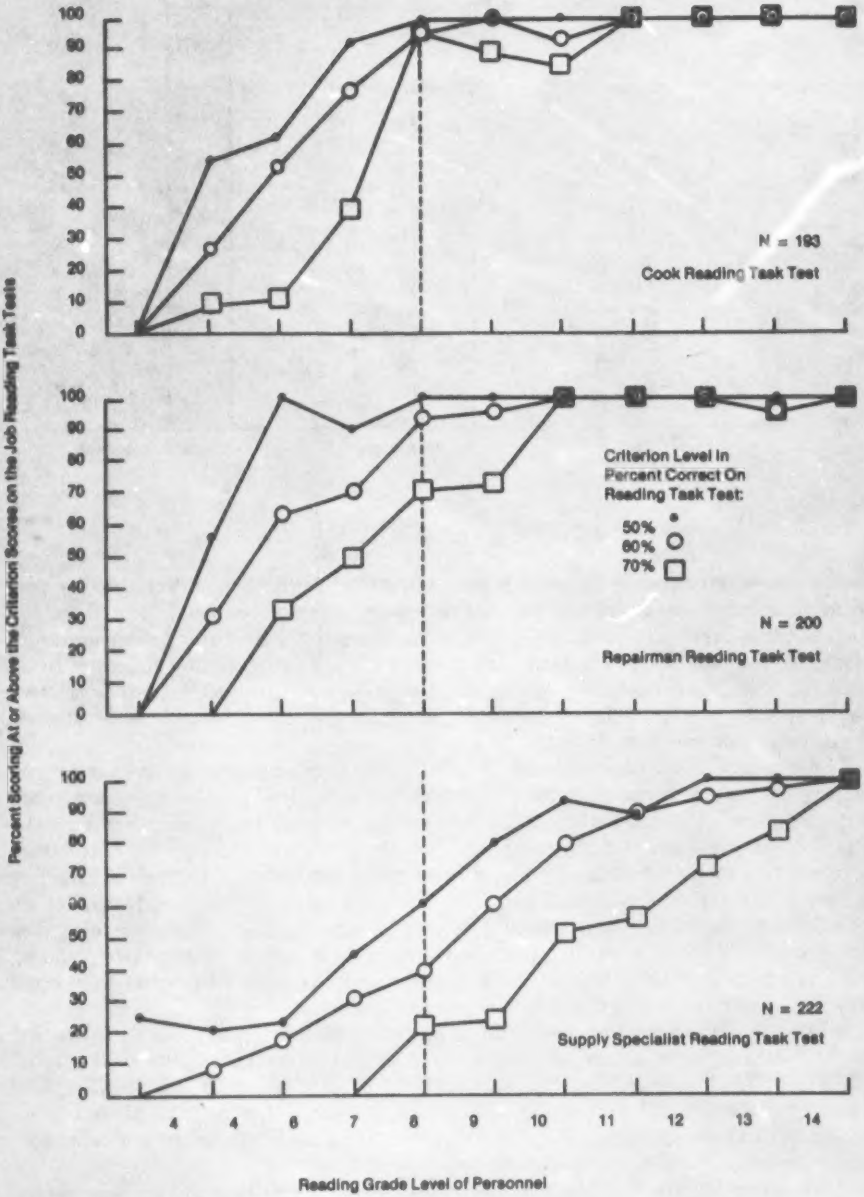
The above information introduces an apparent contradiction. Individuals are performing successfully in jobs where the materials they are required to read exceed their reading capability by up to eight grades. Several explanations of this apparent contradiction can be put forward. The poor readers may be getting someone to do their reading. The general tests of reading comprehension couldd be poor predictors of job-specific reading achievement. Or the readability formulas may overestimate the difficulty of job-related reading tasks.

There is good reason to believe that all three explanations are operating. As reading comprehension tests become more difficult, the vocabulary used often becomes more difficult. Performance on a comprehension test would then be some function of the extent of one's general vocabulary. But clearly the correlation between one's general vocabulary and one's comprehension of job-related reading materials need not be perfect. Therefore, the correlation between performance on standardized comprehension tests and that on job-specific comprehension tests need not be perfect. It is expected that one's comprehension of job-related reading materials measured with respect to the population at large will be better than one's comprehension of reading materials in general.

While the comprehension tests should underestimate an individual's job-specific reading achievement, a readability formula should overestimate the difficulty of job-related reading materials. The readability formula is supposed to be a general index of difficulty. The words in job-specific materials are or may be relatively unfamiliar to the population at large. However, for individuals in the relevant jobs, they may belong to the common parlance.

It would be helpful if either a test or a readability formula could be constructed that took into account the above factors. Better yet would be a reading test that used only job-related reading materials. Sticht, et al. (1971) did just this.

FIGURE A-7
Men at each reading grade level reaching different criterion level on reading task test (%)



Source: Vinsberg, et al. (1971, p. 53).

9.3. Job Reading-Task Tests

Job reading materials were identified by means of structured on-the-job interviews. The most frequently cited materials were selected for inclusion in the test. The tests were designed to demand the same sorts of reading behavior demanded on the job. Three jobs were included: the supply, repairman, and cook jobs.

Suppose a rule were adopted that management wanted literacy training to provide assistance up to the point where 70 percent of the men could get 70 percent correct on the job reading-task tests (the 70/70 criterion typically used in the Army and other services). Then the minimal literacy level for the cooks would be between 7 and 8 (70 percent of the men reading at grade levels between 7 and 8 got on the average 70 percent of the items correct); for repairmen, 8.0; and for supply clerks, 12.0 (see figure A-7).

An estimated 20 percent of the cooks would fail to meet the minimum literacy level, 45 percent of the repairmen would fail, and over 90 percent of the supply clerks would fail. (These figures should not be construed as parameters of the general Army population; lower-aptitude men are overrepresented in the sample.)

The use of written materials actually encountered on the job eliminates one of the problems with previous estimates of functional literacy. The score on the literacy measure does not have to be translated into a score appropriate to the limited domain under consideration. It was argued that a general reading comprehension score would in most cases have to be adjusted upward if it were to be used as a measure of job-specific reading ability. In the present case, the score on the literacy measure is based on material in the domain prescribed by the definition of on-the-job literacy.

Unfortunately, other more difficult problems remain. Few agencies or institutions are prepared to train everyone to the point of measurably perfect comprehension. Practical limitations demand that some criterial or cutoff point be adopted. The selection of this point is no easy matter. Sticht discusses several of the more imaginative and intuitively appealing approaches to the issue of selection. We turn to these approaches.

9.4. The Selection of a Criterion

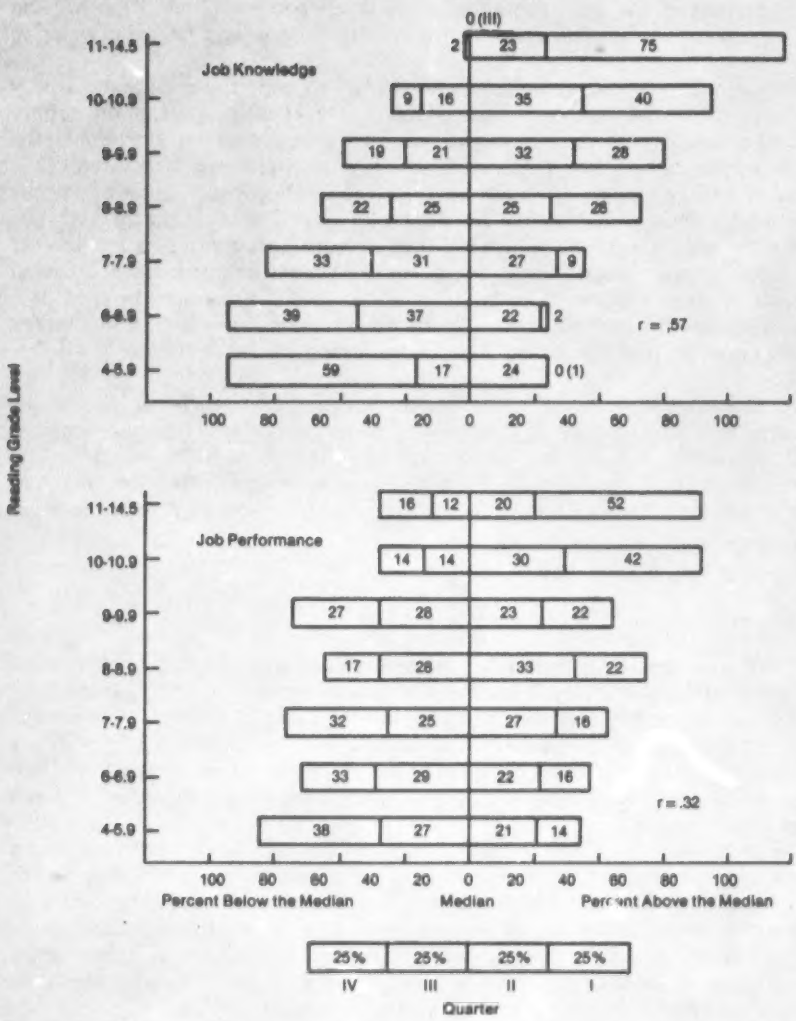
Three measures of job performance were included in the study: supervisor's ratings, job-sample tests, and job-knowledge tests. Supervisor's ratings turned out to be only trivially correlated with performance on either of the two tests or performance on a standardized reading achievement test. No further analysis of the ratings was carried out. Ensuing analyses of the relation between literacy and job performance used only the job-sample and job-knowledge tests as the measure of job performance.

A criterion literacy score was arrived at in the following manner. Sticht reasoned that if reading ability were truly independent of job proficiency, we should expect to find 25 percent of the men reading at a given grade level in the bottom job-performance quartile, 25 percent of the men reading at the same grade level in the second job-performance quartile, and so on. Therefore, as a rule for determining the literacy demands of each occupation, he chose the reading grade level at which the men were most evenly distributed among job-performance quartiles.

Quartile distributions of job-knowledge and job-sample performance were graphed by occupation at each of six reading grade levels (see figures A-8 through A-11). Application of this rule to the obtained distribution suggested a targeted reading level for cooks of 7.0, for repairmen of 8.0, and for supply clerks of 9.0. The

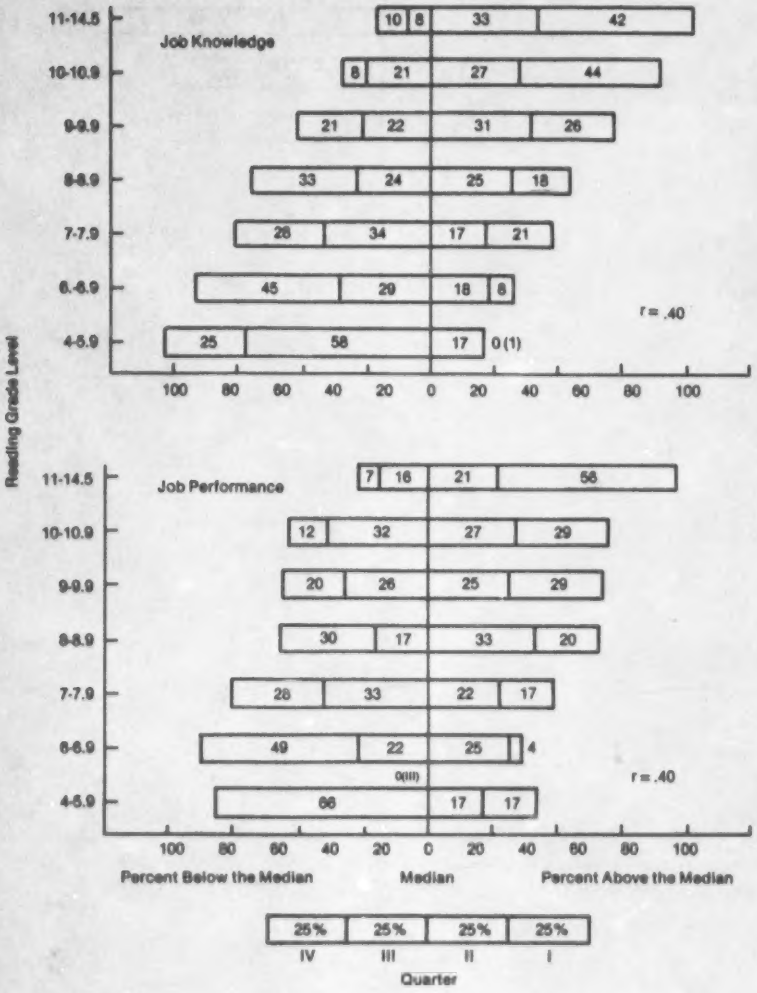
procedure ranked three of these jobs from the least to the most demanding of reading skills in the same order as did the analyses of readability and job reading-task tests.

FIGURE A-8
Quarter distributions of job knowledge and performance by reading grade level: Armor crewman (DOT Code 850.883)



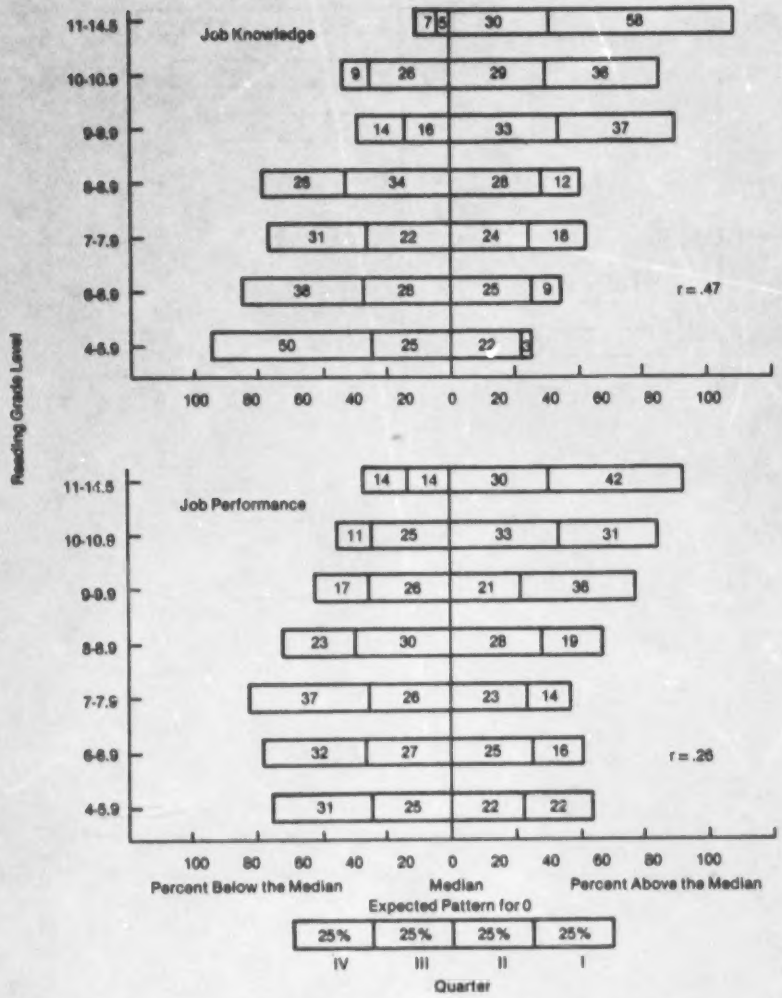
Source: Vineberg, et al. (1971).

FIGURE A-9
Quarter distributions of job knowledge and performance by reading grade level: Supply specialist (DOT Code 223.387)



Source: Vineberg, et al. (1971).

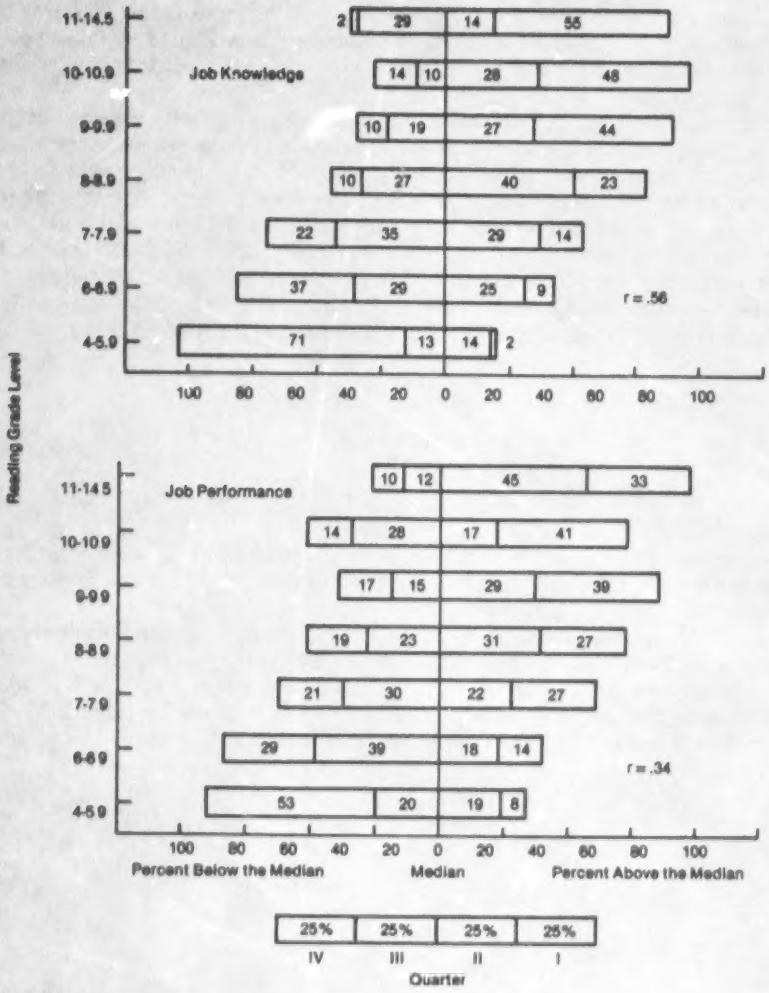
FIGURE A-10
Quarter distributions of job knowledge and performance by reading grade level: Repairman (DOT Code 620.281)



Source: Vineberg, et al. (1971).

FIGURE A-11

Quarter distributions of job knowledge and performance by reading grade level: Cook (DOT Code 310.138)



Source: Vineberg, et al. (1971).

Like most conclusions drawn from correlation data, the conclusion argued for above is open to criticism. The men at different reading grade levels may systematically vary along dimensions besides that of reading achievement. Reading achievement may contribute either significantly or insignificantly to job performance. We simply cannot determine this from the above data.

9.5. Comment and Critique

The research conducted by Sticht and his colleagues points out the importance of using other than traditional literacy measures, e.g., readability formulas and reading achievement tests. Using written materials sampled directly from the job domain is clearly an improvement. More traditional measures are based on a general sample of written materials. The estimates of reading ability or reading difficulty can be too low or too high.

This research also points out the difficulty of arriving at criterion scores, even when using content-valid measures of achievement. Unless one wants to train all individuals to a criterion of perfect performance, one must choose some intermediate level of performance. But the choice of this level involves one in further choices. Many indexes of job performance can be defined. Reading will correlate more highly with some than with others. If one uses correlations much as Sticht and his colleagues do, one must then decide upon a particular index of performance. In short, many decisions, some more arbitrary than others, enter into the neatly packaged estimates of functional literacy that parade across the reader's desk.

NOTES TO APPENDIX

1. To estimate the number of illiterate individuals in 1974 it is necessary to assume that illiteracy rates for the population who have between 0 and 5 years of school are the same in 1974 as they were in 1969.
2. A more thorough discussion of the agencies which have used years of schooling as a criterion for literacy can be found in Harman (1970) and Corder (1971).
3. The research by Louis Harris and Associates was funded by the National Reading Council. The Council was appointed by President Nixon on July 31, 1970. Permission to use the information in this report was granted by Louis Harris and Associates.